



US Army Corps of Engineers  
Charleston District

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# **Request For Proposal**

**PN71119**  
**Training Aids Support Center**  
**Fort Jackson, South Carolina**

U.S. Army Engineer District, Charleston, SC  
Corps of Engineers  
69A Hagood Avenue  
Charleston, South Carolina, 29403-5107

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## 1.0 PROJECT OBJECTIVES

1.0.1 The project objective is to design and construct facilities for the military that are consistent with the design and construction practices used for civilian sector projects that perform similar functions to the military projects. For example, a Company Operations Facility has the similar function as an office/warehouse in the civilian sector; therefore the design and construction practices for a company operations facility should be consistent with the design and construction of an office/warehouse building.

### Comparison of Military Facilities to Civilian Facilities

Military Facility	Civilian Facility
Training Support Facility	Simulation Classroom & Warehouse

1.0.2 It is the Army's objective that these buildings will have a 25-year useful design life before a possible re-use/re-purpose or renovation requirement, to include normal sustainment, restoration, modernization activities and a 50-year building replacement life. Therefore, the design and construction should provide an appropriate level of quality to ensure the continued use of the facility over that time period with the application of reasonable preventive maintenance and repairs that would be industry-acceptable to a major civilian sector project OWNER. The site infrastructure will have at least a 50-year life expectancy with industry-accepted maintenance and repair cycles. The project site should be developed for efficiency and to convey a sense of unity or connectivity with the adjacent buildings and with the Installation as a whole.

1.0.3 Requirements stated in this contract are minimums. Innovative, creative, and life cycle cost effective solutions, which meet or exceed these requirements are encouraged. Further, the OFFEROR is encouraged to seek solutions that will expedite construction (panelization, pre-engineered, etc.) and shorten the schedule. **The intent of the Government is to emphasize the placement of funds into functional/operational requirements. Materials and methods should reflect this by choosing the most economical Type of Construction allowed by code for this occupancy/project allowing the funding to be reflected in the quality of interior/exterior finishes and systems selected.**

## 1.1 SECTION ORGANIZATION

This Section is organized under 6 major "paragraphs".

- (1) Paragraph 1 is intended to define the project objectives and to provide a comparison between the military facility(ies) and comparable "civilian" type buildings.
- (2) Paragraph 2 describes the scope of the project.
- (3) Paragraph 3 provides the functional, operational and facility specific design criteria for the specific facility type(s) included in this contract or task order.
- (4) Paragraph 4 lists applicable industry and government design criteria, generally applicable to all facility types, unless otherwise indicated in the Section. It is not intended to be all-inclusive. Other industry and government standards may also be used, where necessary to produce professional designs, unless they conflict with those listed.
- (5) Paragraph 5 contains Army Standard Design Criteria, generally applicable to all facility types, unless otherwise indicated in the Section.
- (6) Paragraph 6 contains installation and project specific criteria supplementing the other 5 paragraphs.

## 2.0 SCOPE

### 2.1 TRAINING SUPPORT CENTER

- a. Provide a Training Support Center (TSC) to fabricate, maintain, store and issue training devices. The facility contains warehouse space, classrooms and administrative space for management staff.
- b. Size of Facility: The size of the facility stated on the 1391 is 94,925 SF. The facility design guide included in Appendix BB lists facility sizes as small, medium and large. The required size of this facility is as stated above and falls between and medium and a large facility size given in the design guide. The facility floor plan included in Appendix J gives the size, quantity and adjacency of the spaces to be provided.
- c. The Training Support Center Design Guide provided in Appendix BB should be used for space descriptions, not space sizes, as the overall facility requirement does not conform to the “small, medium, large” sizes given in the design guide.
- d. Appendix Q explains Area Computations for MILCON projects. The facility as shown on the floor plan in Appendix J is 93, 169 SF. The total square footage are of the main building is slightly reduced due to the requirements for exterior covered storage, door canopies and covered loading dock. The total sum of these areas cannot exceed the 1391 square footage of 94, 925 SF.
- e. The space adjacency shown on the floor plan in Appendix J shall be maintained in the final design. The size/area of most spaces shall be as shown on the floor plan as well. As stated on the floor plan and Section 01 10 00 paragraph 6.5.2.6 (p), shop and warehouse spaces shall be designed to accommodate the equipment. In “right sizing” those areas, square footage may be shifted between the shops (wood shop, paint shop, pour room, machine shop, injection molding shop) and warehouse spaces. The size of the training, administrative and other spaces shall not be affected.
- f. The mechanical and electrical rooms may be sized to fit the actual equipment. Do not undersize service areas surrounding equipment.
- g. Number of BCT Sets: 1
- h. Number of building stories: One
- i. Device Fabrication: Army-wide fabrication mission
- j. Government Furnished Industrial Equipment: Data provided in Appendix CC

## 2.2. SITE:

Provide all site improvements necessary to support the new building facilities. Refer to Paragraph 6.

Approximate area available 8.00 acres

## 2.3. GOVERNMENT-FURNISHED GOVERNMENT-INSTALLED EQUIPMENT (GFGI)

Coordinate with Government on GFGI item requirements and provide suitable structural support, brackets for projectors/VCRs/TVs, all utility connections and space with required clearances for all GFGI items. Fire extinguishers are GF/GI personal property, while fire extinguisher brackets and cabinets are Contractor furnished and installed CF/CI. All Computers and related hardware, copiers, faxes, printers, video projectors, VCRs and TVs are GFGI.

The following are also GFGI items: There is no additional Government Furnished, Government Installed Equipment for this project, beyond what is stated in the above paragraph.

## 2.4. FURNITURE REQUIREMENTS

Provide furniture design for all spaces listed in Chapter 3 and including any existing furniture and equipment to be re-used. Coordinate with the user to define requirements for furniture systems, movable furniture, storage systems, equipment, any existing items to be reused, etc. Early coordination of furniture design is required for a complete and usable facility.

The procurement and installation of furniture is NOT included in this contract. Furniture will be provided and installed under a separate furniture vendor/installer contract. The general contractor shall accommodate that effort with allowance for entry of the furniture vendor/installer onto this project site at the appropriate time to permit completion of the furniture installation for a complete and usable facility to coincide with the Beneficial Occupancy Date (BOD) of this project. The furniture vendor/installer contract will include all electrical pre-wiring and the whips for final connection to the building electrical systems however; the general contractor shall make the final connections to the building electrical systems under this contract. Furthermore, the general contractor shall provide all Information/Technology (IT) wiring (i.e. LAN, phone, etc.) up to and including the face plate of all freestanding and/or systems furniture desk tops as applicable, the services to install the cable and face plates in the furniture, the coordination with the furniture vendor/installer to accomplish the installation at the appropriate time, and all the final IT connections to the building systems under this contract.

The Government reserves the right to change the method for procurement of and installation of furniture to Contractor Furnished/Contractor Installed (CF/CI). CF/CI furniture will require competitive open market procurement by the Contractor using the Furniture, Fixtures and Equipment (FF&E) package.

## 2.5. NOT USED

### **3.0 TRAINING SUPPORT CENTER**

#### **3.1. FUNCTIONAL/OPERATIONAL REQUIREMENTS**

The Training Support Center Facility (TSC) is composed of five main types of functional areas: Training Space, Classroom; Administrative Spaces (Customer Waiting Area, Administration Offices, Device Maintenance and Repair Area); Warehousing and Storage (Shipping/Receiving Loading Dock, Device Fabrication, Warehouse/Storage Area, Hazardous Materials Storage Area); Special Functional Use Areas (Latrines, Student/Staff Break Areas, Secure Operations Storage, Retail Device Storage); and Support Spaces (Janitor Closet, Mechanical/Electrical Space). Refer to the attached plan for the functional layout.

- 3.1.1. **ACCESSIBILITY REQUIREMENTS.** The Uniform Federal Accessibility Standards (UFAS) established by public law requires any DoD building, except those specifically occupied only by able-bodied personnel, be accessible to the disabled. Therefore the TSC interior design as well as the exterior site circulation considerations shall meet the standards of the Architectural Barriers Act (ABA) and the UFAS standards.

##### **3.1.1.1. Site Plan Design and Construction:**

- (a) Provide ADA compliance access from the parking lot to the building.
- (b) Provide ADA compliant vehicle parking stalls for the facility in accordance with ABA and UFAS requirements.
- (c) Provide handicapped vehicle parking signage and pavement markings.

##### **3.1.1.2. Facility Design and Construction:**

- (a) Facility shall be designed per applicable code and shall be handicapped accessible.
- (b) Provide ADA clearances and door accesses throughout the building.
- (c) Provide ADA accessible drinking fountains.
- (d) Provide ADA accessible public toilet(s).

- 3.1.2. **CORE AREAS.** Refer to Attachment A for definition and space requirements of core areas of the facility.

#### **3.1.5 BETTERMENTS**

- 3.1.5.1 Provide a floor radiant heating element at the Warehouse/Storage area in colder climates.

- 3.1.5.2 **HVAC Instrumentation and Controls:** Provide for connection to energy monitoring and control system (EMCS) for monitoring purposes.

- 3.1.5.3 Provide a closed-circuit television (CCTV)/camera system. Coordinate with the appropriate Installation security office.

- 3.1.5.4 Provide carpet flooring for Customer Waiting area, Administration areas and Conference rooms.

#### **3.2 SITE PLANNING AND DESIGN**

The TSC is located in close proximity to other training facilities; classroom and simulations. Components of land requirements are: primary facility; site egress and ingress; truck/delivery access, utility access; POV parking; and force protection stand-off distances. Future expansion needs should factor a minimum of a 50% expansion of the warehouse component.

Organize the site to be compatible with the site planning and style of adjacent existing structures. Locate the building to reflect local climatic conditions. For example, provide protection from prevailing winds,

snow load, glare, and orient operable windows to take advantage of summer breezes. Locate the building to take advantage of passive solar heating and day lighting.

- 3.2.1 Environmental. Develop the facility site to result in the minimal disturbance to the existing topography, vegetation and drainage patterns and reduce negative impact on the environment.
- 3.2.2 Soils Testing. Retain a qualified geo-technical engineer, licensed in the state of the location for the TSC, to take borings on the site, perform necessary soils testing and to recommend adequate foundation and pavement systems for site specific environmental, soil, rock and water conditions. Document any problematic surface or subsurface conditions such as soil, water, wind, manmade features, or seismic conditions that may affect the design and construction of the TSC in the resultant soils analysis report.
- 3.2.3 Groundwater and Runoff. The control of water flow around the site, site runoff and below grade ground water is critical to ensuring proper long term drainage around the building(s) and the parking areas. The minimum recommended requirements for most soil conditions involve the incorporation of foundation drains. Consideration should include minimizing roof runoff onto grade. Certain soil types may require the piping of roof and site runoff into a controlled storm drainage system.
- 3.2.4 Landscape Design Considerations. Use sustainable landscape features where possible. Utilize plant material to improve the physical appearance of the TSC site and the surrounding community. Where possible preserve trees and planting to enhance the overall visual quality of the facility and the installation. Submit landscape plans to ensure quality and promote design consistency with the architectural theme of the building.
- 3.2.5 Warehouse Hardstand: Design pavement for the appropriate vehicle size being used at the installation.
- 3.2.6 Exterior Lighting. Provide exterior area lighting systems for facility aprons, open storage areas, and parking areas. Provide illumination levels of 50 lux for areas adjacent to the primary facility and 5 lux for parking areas.
- 3.2.7 Perimeter Security Lighting. Provide protective lighting systems in response to project specific requirements to deter trespassers and make them visible to guards. Conform levels of exterior lighting for protected areas to the requirements in the IES Lighting Handbook. Control lighting with a photoelectric cell with manual override.
- 3.2.8 Storm Water Management. Site storm water management may require controls on the peak flow that can be discharged. Installations are required to have a storm water pollution prevention plan. Implement the applicable portions of this plan using best management practices. Segregate drainage from areas likely to be contaminated (e.g., fueling area). Provide treatment for contaminated water prior to its discharge. Maintenance should not be performed outside the primary facility.
- 3.2.9 Parking and Other Access Drives. Provide adequate parking based on the guidance in Attachment A. Locate parking areas so they do not dominate the main entrance and public image of the facility. Comply with UFC 4-010-01 DOD Minimum Antiterrorist Standards for Buildings.

### 3.3 ARCHITECTURE

- 3.3.1 Architectural Theme. Utilize the architectural style, materials and colors indigenous to the region. Consider historical and cultural influences of the installation and region.

- 3.3.2 Architectural Planning. The architectural plan shall accommodate the functional and spatial relationships required for a functionally efficient TSC. Building layouts shall recognize the contrasting operational, administrative and shipping functional requirements and the facility will be designed for the appropriate accomplishment of each function. Circulation Design Considerations. The interior functional arrangement shall allow for ease of circulation and movement and shall consider the safety, health and operational efficiency of the occupants.
- 3.3.7.1 Building Exterior. Select exterior materials to be attractive, economical, and durable and low maintenance. Pre-engineered metal building systems are preferred on the warehouse section of the facility for their factory finished metal siding and roof panels.
- 3.3.7.2 The TSC shall present a cohesive architectural image. Comply with Command and Installation architectural standards. Also, consider the local geographical and cultural environment. Use durable and low-maintenance exterior finishes.
- 3.3.7.3 Ensure that the main entrance is clearly identifiable to discourage visitors from entering the facility Warehouse and Storage area. In cold climates, provide a canopy (or a recess) at required egress doors to ensure that doors can completely open without obstruction from snow and ice. Comply with NFPA 80 Standard.
- 3.3.8 Building Interior.
- 3.3.8.1 Construction and finishes (walls, floor, and ceiling) shall support the cohesive image and theme of the facility.
- 3.3.8.2 Durability is extremely important when specifying materials for interior construction and finishes. Heavy equipment is regularly handled throughout the facility. These conditions will lead to greater interior damage being incurred compared too many other facility types.
- i. Casework: Provide counters, casework, and cabinets of high-quality and durable construction with Premium or Custom finishes in accordance with current AWI Quality Standards. At a minimum use plastic laminate doors, drawers, and casework faces. Where no water source is present, countertops shall be plastic laminate as a minimum. Where a water source is present, countertops shall be solid surface/solid composite plastics only.
  - ii. Interior Finishes: Finishes must take into account the intended uses, be highly durable, and meet the requirements listed in NFPA 101 Life Safety Code.
- 3.3.9 Floors. Provide highly durable and easily maintained flooring in the warehousing area, fabrication area, device maintenance/repair area, mechanical, electrical and storage areas. As a minimum provide resilient flooring in other areas.
- 3.3.10 Natural Lighting. Provide as much natural lighting as feasibly possible throughout the building. Natural lighting must be capable of being totally blocked from the Simulation Classrooms.
- 3.3.11 Warehouse Doors. Provide electrically operated doors with provision for manual chain operation.
- i. Locking. Provide overhead doors that are operable from the interior only. Coordinate door locking requirements with the using service.
  - ii. Serviceability. Design doors to meet heavy duty loads and high frequency of operation. Conduct testing of deflection and operation of the doors prior to acceptance during construction. Doors shall be provided and installed by a commercial door company having not less than five years of experience in manufacturing, installing, and servicing the size and type of doors provided.
  - iii. Insulated Doors. Preference will be given to proposals that include insulated doors for thermal resistance and noise control.
- 3.3.12 Personnel Doors. Provide exterior personnel doors in the ends of central corridor maintenance areas and in the circulation bays as shown in the functional area adjacency diagram in Attachment A. Provide steel

doors with vision panels, except at storage, janitorial, and latrine areas. Minimum size for personnel doors is 3 feet wide by 7 feet high.

### 3.3.13 Special Acoustical Requirements

Typical STC ratings range from 35 to 55 STC depending on the space and its intended use. During design, special consideration should be given by the design team to achieving the minimum required STC values by treating wall surfaces, wall openings, and the structure with sound attenuating materials.

### 3.3.14 Finishes

#### 3.3.14.1 Paint

- i. All paints used shall be listed on the "Approved product list" of the Master Painters Institute, (MPI). Application criteria shall be as recommended by Master Painters Institute (MPI) guide specifications for the substrate to be painted and the environmental conditions existing at the project site.
- ii. Exterior surfaces, except factory pre-finished material or exterior surfaces receiving other finishes shall be painted a minimum of one prime coat and two finish coats. Paints having a lead content over 0.06 percent by weight of nonvolatile content are unacceptable. Paints containing zinc-chromate, strontium-chromate, mercury or mercury compounds, confirmed or suspected human carcinogens shall not be used on this project. Exterior paints and coating products shall be classified as containing low volatile organic compounds (VOCs) in accordance with MPI criteria. Application criteria shall be as recommended by MPI guide specifications. Provide an MPI Gloss Level 5 Finish (Semi-gloss), unless otherwise specified.
- iii. Interior surfaces, except factory pre-finished material or interior surfaces receiving other finishes shall be painted a minimum of one prime coat and two finish coats. Paints having a lead content over 0.06 percent by weight of nonvolatile content are unacceptable. Paints containing zinc-chromate, strontium-chromate, mercury or mercury compounds, confirmed or suspected human carcinogens shall not be used on this project. Interior paints and coating products shall contain a maximum level of 150 g/l (grams per liter) of volatile organic compounds (VOCs) for non-flat coatings and 50 g/l of VOCs for flat coatings. Provide an MPI Gloss Level 5 Finish (Semi-gloss) in wet areas and a flat finish in all other areas.

#### 3.3.14.2 Minimum Interior Finishes

- i. Designers are not limited to finishes listed in this section and are encouraged to offer higher quality finishes.
- ii. Wall, ceiling and floor finishes and movable partitions shall conform to the requirements of the IBC, NFPA and UFC 3-600-01. Where code requirements conflict, the most stringent code requirement shall apply.
- iii. Resilient and ceramic flooring are preferred. If selected, vinyl composition tile (VCT) shall be a minimum 1/8 inch thick, conforming to ASTM F 1066, Class 2, through-pattern tile, Composition 1, asbestos free, with color and pattern uniformly distributed throughout the thickness of the tile.
- iv. Walls: All wall finish shall be painted gypsum board, except where stated otherwise. Use impact resistant gypsum board in corridors and the centralized laundry, if provided.
- v. All ceiling finishes shall be painted gypsum board, except where stated otherwise.

## 3.4 STRUCTURAL REQUIREMENTS

Design and construct as a complete system in accordance with APPLICABLE CRITERIA.

## 3.5 MECHANICAL REQUIREMENTS



3.5.1 Fire Protection. Design the system in accordance with applicable criteria and code. Base warehouse sprinkler protection on Class IV commodities, as defined by NFPA 13, unless a more severe class of storage is anticipated, also base on maximum potential height of storage.

3.5.2 Plumbing. Provide facilities with a fully functional plumbing system that complies with the International Plumbing Code (IPC). Provide hose bibs or wall hydrants for the facility. A Philadelphia (one pipe), air admittance valve system, engineered vent system, or a sovent (aerator) type system will not be permitted.

3.5.3 Heating, Ventilating and Air-Conditioning (HVAC)

Provide facilities with a HVAC system that is automatically controlled by a Building Automation System (BAS). Air conditioning is prohibited in the warehouse and storage areas; however, these spaces are to be heated..

### 3.6 ELECTRICAL REQUIREMENTS

Electrical power, lighting and telecommunications shall be provided to the facility as specified below, in accordance with APPLICABLE CRITERIA, GENERAL TECHNICAL REQUIREMENTS, all IEEE Standards (including Recommended Practice) where the scope is applicable to this design effort, all UL Standards where the UL scope is applicable to this design effort, and where itemized in the combined interdisciplinary areas cited.

(a) Perform a short circuit study as an integral part of selecting and sizing electrical distribution components (all equipment shall be fully rated; that is, do not use series-combination rated equipment).

(b) Perform a coordination study to ensure that protective device settings are appropriate for the expected range of conditions (depending on the design and construction schedule, it is acceptable to design adequate protective devices with adjustable features, followed by a coordination study required during construction to specify the correct settings.)

(c) Circuit breakers, disconnect switches, and other devices that meet the OSHA definition of energy-isolating device must be lockable.

(d) Do not exceed 5 percent combined voltage drop on feeders and branch circuits if the transformer providing service is located within the facility. If the transformer is located exterior to the facility, limit the combined voltage drop for service conductors, feeders, and branch circuits to 5 percent. Individual voltage drop on branch circuits should not exceed 3 percent. Branch circuits supplying sensitive circuits should be limited to 1 percent voltage drop.

(e) In general, to minimize sound transmission, do not install "back-to-back" outlet boxes.

(f) Locate electrical distribution equipment installed within the facility, including dry-type transformers and electrical panels, within dedicated electrical rooms/closets.

3.6.1 Interior Electrical Power: When facility electrical design includes a 480/277V power distribution system, mechanical systems and lighting systems shall generally be fed from the available 480/277V power distribution system.

3.6.1.1. Receptacle Placement: In accordance with applicable codes, standards, referenced UFCs, and the attachments to this section. In general, provide wall duplex outlets, not less than 10 feet on center. Provide not less than one duplex outlet per wall on walls less than 9 feet long. Locate outlets to eliminate the need for extension cords. Above counter receptacles shall be mounted in the vertical wall space above the counter-top. Data, CATV, and CCTV outlets shall each be provided with an associated duplex receptacle.

3.6.1.2. Mounting Height: In accordance with applicable codes, standards, referenced UFCs, and the attachments to this section. Unless indicated otherwise, mount general use receptacles 18 inches above finished floor.

3.6.1.3 Special Power Requirements:

3.6.1.3.1. Simulation Classrooms: Each Simulation Classroom will be provided with dedicated circuits to support the number of Engagement Skills Trainer (EST) subsystems required. It is possible that one, two, or three 5-lane EST subsystems will be required in a simulation classroom.

- a. Each CONUS/60 Hz EST subsystem requires: One dedicated 120V, 60 Hz, 15 Amp circuit with duplex receptacle located within 20 ft of the Instructor/Operator Station (IOS). One dedicated 120V, 60 Hz, 20 Amp circuit with duplex receptacle located within 8 ft of EST subsystem air compressor.
- b. Each EST subsystem in OCONUS location with 50 Hz power distribution requires: One dedicated 220V, 50 Hz, 7.5 Amp circuit with duplex receptacle located within 20 ft of the Instructor/Operator Station (IOS). One dedicated 220V, 50 Hz, 10 Amp circuit with duplex receptacle located within 8 ft of EST subsystem air compressor.

### 3.6.2 Interior Lighting

3.6.2.1. General Lighting: In accordance with applicable codes, standards, referenced UFCs, and the attachments to this section. Lighting design shall consider ease of facility maintenance and minimize the lamp types and wattages used throughout the facility. Provide emergency lighting in all areas required by NFPA 101. Whenever possible, unless otherwise noted, incorporate the emergency lighting into the normally provided lighting fixtures. When natural lighting is provided in a space, the artificial lighting design shall consider and use daylighting control systems whenever it is feasible to reduce energy usage when the natural lighting is available.

3.6.2.2. Dimming and Switching: In accordance with applicable codes, standards, referenced UFCs, and the attachments to this section. Where dimmer controls are used, provide lighting fixtures that do not oscillate visibly at low intensities. Provide Three-Way/ Four-Way Switching for rooms/areas with more than one entrance.

### 3.6.3 Special Lighting Requirements

3.6.3.1 Simulation Classrooms: Provide zoned lighting schemes. Two lighting schemes are required for this classroom. First lighting scheme provides lighting for the space to be used for training with the Engagement Skills Trainer. Second lighting scheme provides lighting for the space to be used as a multipurpose classroom.

3.6.3.1.1 Lighting when used for training with Engagement Skills Trainer (EST): All natural lighting must be blocked/blacked out for training with EST. Provide lighting over firing line only. Provide fully dimmable lighting over the firing line from 0 to 30 fc. Lighting over the firing line shall be designed so that it is not directed at and does not interfere with the EST projection screen(s).

3.6.3.1.2 Lighting when used for multipurpose classroom: Natural lighting is allowed. Provide fully dimmable general space ambient lighting from 0 to 50 fc. Assure fixture selected minimizes possible interference with use of the room for training with EST (for example, because of the lasers used during training open type specular reflectors or highly reflective exposed surfaces would not be appropriate). Fixtures shall be mounted so that bottom of fixture is no less than 8 feet above finished floor.

3.6.4 Mass Notification. Provide a Mass Notification System (MNS) in accordance with UFC 4-021-01 that interfaces with the installation MNS to provide emergency notifications of an area, regional or national nature. The MNS may be combined with the Fire Alarm System to prevent duplication of devices and maintenance depending on the Authority Having Jurisdiction (AHJ) at the installation.

## 3.7 TELECOMMUNICATIONS REQUIREMENTS

Provide all telecommunications in accordance with the current version of the Technical Criteria for Installation Information Infrastructure Architecture (I3A). Telecommunications provide access to post voice and data systems. Interior telecommunications provided voice and data services, wireless (as needed) and primary facility intercom system connectivity.

3.7.1 Service: Coordinate service with local NEC personnel.

3.7.2 System: Provide a fully operational system from the demarcation point to each outlet. In addition to the requirements of the I3A Technical Criteria, provide a telecommunications outlet, with a minimum of one voice jack and one data jack, at the left rear of each classroom.

3.7.3 Outside Plant Telecommunications: Provide outside plant cabling and support facilities as required by the local DOIM.

### 3.8 CABLE TV (CATV) REQUIREMENTS

Install CATV outlets in waiting, break, conference room and director's office. All CATV outlet boxes, connectors, cabling, and cabinets shall conform to the I3A Technical Criteria unless noted otherwise. All horizontal cabling shall be homerun from the CATV outlet to the nearest telecommunications room.

### 3.9 FIRE ALARM REQUIREMENTS

Provide a complete addressable Fire Alarm System for the facility. The system may be combined with MNS and consider incorporating PA system to reduce device and maintenance costs. This system shall consist of a control panel, a communications device, initiating devices, notification devices and associated wiring and pathways. Provide a Class A addressable system in accordance with UFC 3-600-01.

### 3.10 PHYSICAL SECURITY REQUIREMENTS

3.10.1 Electronic Security System (ESS): An Intrusion Detection System(IDS) is required for the arms secure storage room and shall comply with Army Regulation 190-11, **Physical Security of Arms, Ammunition, and Explosives**, Provide dedicated infrastructure, power and communication within the appropriate regulatory conveyance inside of the protected area with connectivity to the central security monitoring station.

3.10.2 Security Lighting. The lighting will be sufficient to allow guards (or individuals responsible for maintaining surveillance) to see illegal acts such as forced entry, or the unauthorized removal of arms during hours of reduced visibility. Lighting will provide a minimum of 0.2 foot-candles (2lux) illumination measured on the horizontal plane at ground level. Interior and exterior lighting will be provided for all buildings in which arms storage rooms are located and arms storage rooms.

### 3.10 ATTACHMENTS

- a. Attachment A – Training Support Center (TSC), Army Criteria Tracking System Standard Information, Category Code 14129
- b. TSC Plan

#### 4.0 APPLICABLE CRITERIA

Unless a specific document version or date is indicated, use criteria from the most current references, including any applicable addenda, unless otherwise stated in the contract or task order, as of the date of the Contractor's latest accepted proposal or date of issue of the contract or task order solicitation, whichever is later. In the event of conflict between References and/or Applicable Military Criteria, apply the most stringent requirement, unless otherwise specifically noted in the contract or task order.

##### 4.1. INDUSTRY CRITERIA

Applicable design and construction criteria references are listed in Table 1 below. This list is not intended to include all criteria that may apply or to restrict design and construction to only those references listed. See also Paragraph 3 for additional facility-specific applicable criteria.

**Table 1: Industry Criteria**

<b>Air Conditioning and Refrigeration Institute (ARI)</b>	
ARI 310/380	Packaged Terminal Air-Conditioners and Heat Pumps
ARI 440	Room Fan-Coil and Unit Ventilator
ANSI/ARI 430-99	Central Station Air Handling Units
ARI 445	Room Air-Induction Units
ARI 880	Air Terminals
<b>Air Movement and Control Association (AMCA)</b>	
AMCA 210	Laboratory Methods of Testing Fans for Rating
<b>American Architectural Manufacturers Association (AAMA)</b>	
AAMA 605	Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA 607.1	Voluntary Guide Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
AAMA 1503	Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
<b>American Association of State Highway and Transportation Officials (AASHTO)</b>	
	Roadside Design Guide [guardrails, roadside safety devices]
	Standard Specifications for Transportation Materials and Methods of

	Sampling and Testing [Road Construction Materials]
	Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals
	Guide for Design of Pavement Structures, Volumes 1 and 2 [pavement design guide]
	A Policy of Geometric Design of Highways and Streets
<b>American Bearing Manufacturers Association (AFBMA)</b>	
AFBMA Std. 9	Load Ratings and Fatigue Life for Ball Bearings
AFBMA Std. 11	Load Ratings and Fatigue Life for Roller Bearings
<b>American Boiler Manufacturers Association (ABMA)</b>	
ABMA ISEI	Industry Standards and Engineering Information
<b>American Concrete Institute</b>	
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 318	Building Code Requirements for Structural Concrete
ACI SP-66	ACI Detailing Manual
ACI 530	Building Code Requirements for Masonry Structures
<b>ADA Standards for Accessible Design</b>	
See US Access Board	ADA and ABA Accessibility Guidelines for Buildings and Facilities, Chapters 3-10.
<b>American Institute of Steel Construction (AISC)</b>	
	Manual of Steel Construction – 13 <sup>th</sup> Edition (or latest version)
<b>American Iron and Steel Institute</b>	
AISI S100	North American Specification for the Design of Cold-Formed Steel Structural Members
<b>American National Standards Institute 11 (ANSI)</b>	

ANSI Z21.10.1	Gas Water Heaters Vol. 1, Storage water Heaters with Input Ratings of 75,000 Btu per Hour or less
ANSI Z124.3	American National Standard for Plastic Lavatories
ANSI Z124.6	Plastic Sinks
ANSI Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
ANSI/IEEE C2-2007	National Electrical Safety Code
ANSI/AF&PA NDS-2001	National Design Specification for Wood Construction
<b>American Society of Civil Engineers (ASCE)</b>	
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASCE 37	Design and Construction of Sanitary and Storm Sewers, Manuals and Reports on Engineering Practice [sanitary sewer and storm drain design criteria]
ASCE/SEI 31-03	Seismic Evaluation of Existing Buildings [Existing Building Alteration/Renovation]
ASCE/SEI 41-06	Seismic Rehabilitation of Existing Buildings [Existing Building Alteration/Renovation]
<b>American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)</b>	
ASHRAE 90.1	ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE Guideline 0	The Commissioning Process
ASHRAE Guideline 1.1	The HVAC Commissioning Process
ASHRAE Handbooks	Fundamentals, HVAC Applications, Systems and Equipment, Refrigeration (Applicable, except as otherwise specified)
ASHRAE Standard 15	Safety Standard for Refrigeration Systems
ASHRAE Standard 62.1	Ventilation for Acceptable Indoor Air Quality
ASHRAE Standard 55	Thermal Environmental Conditions for Human Occupancy (Design portion is applicable, except where precluded by other project requirements.)

<b>American Society of Mechanical Engineers International (ASME)</b>	
ASME BPVC SEC VII	Boiler and Pressure Vessel Code: Section VII Recommended Guidelines for the Care of Power Boilers
ASME A17.1	Safety Code for Elevators and Escalators
ASME B 31 (Series)	Piping Codes
<b>American Water Works Association (AWWA)</b>	
	Standards [standards for water line materials and construction]
<b>American Welding Society</b>	
	Welding Handbook
	Welding Codes and Specifications (as applicable to application, see International Building Code for example)
<b>Architectural Woodwork Institute (AWI)</b>	
Latest Version	AWI Quality Standards
<b>Associated Air Balance Council (AABC)</b>	
AABC MN-1	National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems
	AABC Associated Air Balance Council Testing and Balance Procedures
<b>ASTM International</b>	
ASTM C1060-90(1997)	Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM E 779 (2003)	Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E1827-96(2002)	Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
<b>Builders Hardware Manufacturers Association (BHMA)</b>	
ANSI/BHMA	The Various BHMA American National Standards

<b>Building Industry Consulting Service International</b>	
	Telecommunications Distribution Methods Manual (TDMM)
	Customer-Owned Outside Plant Design Manual (CO-OSP)
<b>Code of Federal Regulations (CFR)</b>	
49 CFR 192	Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards
10 CFR 430	Energy Conservation Program for Consumer Products
<b>Consumer Electronics Association</b>	
CEA 709.1B	Control Network Protocol Specification
CEA 709.3	Free-Topology Twisted-Pair Channel Specification
CEA 852	Tunneling Component Network Protocols Over Internet Protocol Channels
<b>Electronic Industries Association (EIA)</b>	
ANSI/EIA/TIA 568	Structured Cabling Series
ANSI/EIA/TIA 569	Commercial Building Standard for Telecommunications Pathways and Spaces (includes ADDENDA)
ANSI/TIA/EIA-606	Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings
J-STD EIA/TIA 607	Commercial Building Grounding and Bonding Requirements for Telecommunications
<b>Federal Highway Administration (FHWA)</b>	
	Manual on Uniform Traffic Control Devices for Streets and Highways [signage and pavement markings for streets and highways]
FHWA-NHI-01-021	Hydraulic Engineering Circular No. 22, Second Edition, URBAN DRAINAGE DESIGN MANUAL
<b>Illuminating Engineering Society of North America (IESNA)</b>	
IESNA RP-1	Office Lighting



IESNA RP-8	Roadway Lighting
IESNA Lighting Handbook	Reference and Application
<b>Institute of Electrical and Electronics Engineers Inc. (IEEE)</b>	
	Standard for Use of the International System of Units (SI): the Modern Metric System
Standard 1100	Recommended Practice for Powering and Grounding Sensitive Electronic Equipment
<b>International Code Council (ICC)</b>	
IBC	<p>International Building Code</p> <p>Note: All references in the International Building Code to the International Electrical Code shall be considered to be references to NFPA 70.</p> <p>All references in the International Building Code to the International Fuel Gas Code shall be considered to be references to NFPA 54 and NFPA 58.</p> <p>All references in the International Building Code to the International Fire Code and Chapter 9 shall be considered to be references to Unified Facilities Criteria (UFC) 3-600-01.</p>
IMC	<p>International Mechanical Code –</p> <p>Note: For all references to “HEATING AND COOLING LOAD CALCULATIONS”, follow ASHRAE 90.1</p> <p>Note: For all references to “VENTILATION”, follow ASHRAE 62.1</p>
IRC	International Residential Code
IPC	International Plumbing Code
IEC	Energy Conservation Code (IEC) –Applicable only to the extent specifically referenced herein. Refer to Paragraph 5, ENERGY CONSERVATION requirements.
IGC	International Gas Code - not applicable. Follow NFPA 54, National Fuel Gas Code and NFPA 58, Liquefied Petroleum Gas Code.
<b>International Organization for Standardization (ISO)</b>	
ISO 6781:1983	Qualitative detection of thermal irregularities in building envelopes –

	infrared method
<b>LonMark International (LonMark)</b>	
LonMark Interoperability Guidelines	(available at <a href="http://www.lonmark.org">www.lonmark.org</a> ), including: Application Layer Guidelines, Layer 1-6 Guidelines, and External Interface File (XIF) Reference Guide
LonMark Resource Files	(available at <a href="http://www.lonmark.org">www.lonmark.org</a> ), including Standard Network Variable Type (SNVT) definitions
<b>Metal Building Manufacturers Association (MBMA)</b>	
	Metal Building Systems Manual
<b>Midwest Insulation Contractors Association (MICA)</b>	
	National Commercial and Industrial Insulation Standards Manual
<b>National Association of Corrosion Engineers International (NACE)</b>	
NACE RP0169	Control of External Corrosion on Underground or Submerged Metallic Piping Systems
NACE RP0185	Extruded, Polyolefin Resin Coating Systems with Adhesives for Underground or Submerged Pipe
NACE RP0285	Corrosion Control of Underground Storage Tank Systems by Cathodic Protection
NACE RP0286	Electrical Isolation of Cathodically Protected Pipelines
<b>National Electrical Manufacturers Association (NEMA)</b>	
<b>National Environmental Balancing Bureau (NEBB)</b>	
	Procedural Standards Procedural Standards for Testing Adjusting Balancing of Environmental Systems
<b>National Fire Protection Association (NFPA)</b>	
NFPA 10	Standard for Portable Fire Extinguishers
NFPA 13	Installation of Sprinkler Systems
NFPA 13R	Residential Occupancies up to and Including Four Stories in Height Sprinkler Systems

NFPA 14	Standard for the Installation of Standpipes and Hose Systems
NFPA 20	Installation of Centrifugal Fire Pumps
NFPA 24 NFPA 25	Standard for the Installation of Private Fire Service Mains and Their Appurtenances [underground fire protection system design]  Inspection, Testing And Maintenance Of Water-Based Fire Protection Systems
NFPA 30	Flammable and Combustible Liquids Code
NFPA 30A	Motor Fuel Dispensing Facilities and Repair Garages
NFPA 31	Installation of Oil Burning Equipment
NFPA 54	National Fuel Gas Code
NFPA 58	Liquefied Petroleum Gas Code
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm Code
NFPA 76	Fire Protection of Telecommunications Facilities
NFPA 80	Standard for Fire Doors and Fire Windows
NFPA 90a	Installation of Air Conditioning and Ventilating Systems
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
NFPA 101	Life Safety Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
<b>National Roofing Contractor's Association (NRCA)</b>	
	Roofing and Waterproofing Manual
<b>National Sanitation Foundation, International</b>	
NSF/ANSI Std. 2, 3, 4, 5, 6, 7, 8, 12, 13, 18, 20, 21, 25, 29, 35, 36, 37, 51, 52, 59,	Food Equipment Standards

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ANSI/UL Std. 73, 197, 471, 621, 763	Food Equipment Standards
CSA Std. C22.2 No. 109, 120, 195	Food Equipment Standards
<b>Occupational Safety and Health Administration (OSHA)</b>	
Title 29, Part 1926	OSHA Construction Industry Standards, Title 29, Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction
<b>Plumbing and Drainage Institute (PDI)</b>	
PDI G 101	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI WH201	Water Hammer Arrestors
<b>Precast Concrete Institute</b>	
PCI Design Handbook	Precast and Prestressed Concrete
<b>Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)</b>	
SMACNA HVAC Duct Construction Standards	HVAC Duct Construction Standards - Metal and Flexible
SMACNA Architectural Manual	Architectural Sheet Metal Manual
SMACNA HVAC TAB	HVAC Systems - Testing, Adjusting and Balancing
<b>State/Local Regulations</b>	
	State Department of Transportation Standard Specifications for Highway and Bridge Construction
	Sedimentation and Erosion Control Design Requirements
	Environmental Control Requirements
	Storm Water Management Requirements
<b>Steel Door Institute (SDI)</b>	

ANSI A250.8/SDI 100	Standard Steel Doors and Frames
<b>Steel Deck Institute</b>	
	SDI Diaphragm Design Manual
<b>Steel Joist Institute</b>	
	Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders
<b>Underwriters Laboratories (UL)</b>	
UL 96A	Installation Requirements for Lightning Protection Systems
UL 300	Standard for Safety for Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas
<b>UNITED STATES ACCESS BOARD: U.S. ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD</b>	
ADA and ABA Accessibility Guidelines for Buildings and Facilities	<p>ABA Accessibility Standard for DoD Facilities</p> <p>Derived from the ADA and ABA Accessibility Guidelines: Specifically includes: ABA Chapters 1 and 2 and Chapters 3 through 10.</p> <p>Use this reference in lieu of IBC Chapter 11.</p> <p>Excluded are:</p> <p>(a) Facilities, or portions of facilities, on a military installation that are designed and constructed for use exclusively by able-bodied military personnel (See Paragraph 3 for any reference to this exclusion).</p> <p>(b) Reserve and National Guard facilities, or portions of such facilities, owned by or under the control of the Department of Defense, that are designed and constructed for use exclusively by able-bodied military personnel. (See paragraph 3 for any reference to this exclusion).</p>
<b>U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES</b>	
	FDA National Food Code
<b>U.S. GREEN BUILDING COUNCIL (USGBC)</b>	
LEED-NC	Green Building Rating System for New Construction & Major Renovations
	Application Guide for Multiple Buildings and On-Campus Building Projects

## 4.2. MILITARY CRITERIA

The project shall conform to the following criteria. Certain design impacts and features due to these criteria are noted for the benefit of the offeror. However, all requirements of the referenced criteria will be applicable, whether noted or not, unless otherwise specified herein.

4.2.1. Energy Policy Act of 2005 (Public Law 109-58) (applies only to the extent specifically implemented in the contract, which may or may not directly cite or reference EPACT)

4.2.2. Executive Order 12770: Metric Usage In Federal Government

(a) Metric design and construction is required except when it increases construction cost. Offeror to determine most cost efficient system of measurement to be used for the project.

4.2.3. TB MED 530: Occupational and Environmental Health Food Sanitation

4.2.4. Unified Facilities Criteria (UFC) 3-410-01FA: Heating, Ventilating, and Air Conditioning - applicable only to the extent specified in paragraph 5, herein.

4.2.5. Deleted.

4.2.6. UFC 3-600-01 Design: Fire Protection Engineering for Facilities. Use the latest edition of the IBC in coordination with this UFC. Use Chapters 3, 6, 7, 33 and UFC 3-600-01. If any conflict occurs between these Chapters and UFC 3-600-01, the requirements of UFC 3-600-01 take precedence. Use UFC 3-600-01 in lieu of IBC Chapters 4, 8,9,10.

4.2.7. UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings

4.2.8. UFC 4-023-03 Design of Buildings to Resist Progressive Collapse (Use most recent version, regardless of references thereto in other publications)

(a) Note the option to use tie force method or alternate path design for Occupancy Category II.

4.2.9. UFC 4-021-01 Design and O&M: Mass Notification Systems

4.2.10. Technical Criteria for Installation Information Infrastructure Architecture (I3A)

(a) Email: [DetrickISECI3Aguide@conus.army.mil](mailto:DetrickISECI3Aguide@conus.army.mil)

4.2.11. U.S. Army Information Systems Engineering Command (USAISEC) SECRET Internet Protocol (IP) Router Network (SIPRNET) Technical Implementation Criteria (STIC).. See Paragraph 3 for applicability to specific facility type. May not apply to every facility. This is mandatory criteria for those facilities with SIPRNET.

4.2.11.1. Draft Guide Specification for Section 27 05 28 PROTECTIVE DISTRIBUTION SYSTEM (PDS) FOR SIPRNET COMMUNICATIONS SYSTEMS, found at [http://mrsi.usace.army.mil/rfp/Shared%20Documents/SECTION\\_270528-v3.pdf](http://mrsi.usace.army.mil/rfp/Shared%20Documents/SECTION_270528-v3.pdf)

## 5.0 GENERAL TECHNICAL REQUIREMENTS

This paragraph contains technical requirements with general applicability to Army facilities. See also Paragraph 3 for facility type-specific operational, functional and technical requirements. Residential or similar grade finishes and materials are not acceptable for inclusion in these buildings, unless otherwise specifically allowed.

### 5.1. SITE PLANNING AND DESIGN

5.1.1. STANDARDS AND CODES: The site planning and design shall conform to APPLICABLE CRITERIA and to paragraph 6, PROJECT SPECIFIC REQUIREMENTS.

5.1.2. SITE PLANNING OBJECTIVES: Group buildings in configurations that create a sense of community and promote pedestrian use. See paragraph 3 for additional site planning requirements relating to building functions.

5.1.2.1. Provide enclosures and or visual screening devices for Outdoor Utility such as dumpsters, emergency generators, transformers, heating, ventilation, and air conditioning units from streetscape and courtyard views to limit visual impact. Enclosures shall be compatible with the building they serve and accessible by vehicle. The location of dumpsters can have a significant visual impact and should be addressed as part of an overall building design and incorporated in site planning.

5.1.2.2. Where included in the project, dumpster pads shall be concrete (minimum of 8 inches thick on 4 inch base course, unless site conditions dictate more conservative requirements) and directly accessible by way of a paved service drive or parking lot with adequate overhead clearance for collection vehicles. Provide space at dumpster areas for recycling receptacles. Coordinate with Installation on recycling receptacle types, sizes and access requirements and provide space at dumpster areas to accommodate them.

5.1.2.3. Vehicular Circulation. Apply design vehicle templates provided by the American Association of State Highway and Transportation Officials (AASHTO) to the site design. The passenger car class includes passenger cars and light trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational – privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Provide vehicle clearances required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Provide required traffic control signage Site entrances and site drive aisles shall maximize spacing between drives, incorporate right-angle turns, and limit points of conflict between traffic. Design Services Drives to restrict access to unauthorized vehicles by removable bollards, gates, or other barriers to meet Anti-Terrorism/Force Protection (ATFP) requirements. Orient service drives to building entrances other than the primary pedestrian entry at the front of the building.

5.1.2.4. Provide Emergency Vehicle Access around the facility and shall be in accordance with AT/FP requirements. Maintain a 33-foot clear zone buffer for emergency vehicles, designed to prevent other vehicles from entering the AT/FP standoff to the building.

5.1.2.5. Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible. Protect trees to be saved during the construction process from equipment.

5.1.2.6. Stormwater Management. Employ design and construction strategies (Best Management Practices) that reduce stormwater runoff, reduce discharges of polluted water offsite and maintain or restore predevelopment hydrology with respect to temperature, rate, volume and duration of flow to the maximum extent practicable. See paragraph 6, PROJECT SPECIFIC requirements for additional information.

5.1.3. EXTERIOR SIGNAGE: Provide exterior signage in accordance with Appendix H, Exterior Signage. Provide exterior NO SMOKING signage that conveys building and grounds smoking policy.

5.1.4. EXISTING UTILITIES: Base utilities maps and capacities for this site are included as part of this RFP. See paragraph 6 for more detailed information.

### 5.2. SITE ENGINEERING

5.2.1. STANDARDS AND CODES: The site engineering shall conform to APPLICABLE CRITERIA.

5.2.2. SOILS:

5.2.2.1. A report has been prepared to characterize the subsurface conditions at the project site and is **appended to these specifications**. The report provides a general overview of the soil and geologic conditions with detailed descriptions at discrete boring locations. The Contractor's team shall include a licensed geotechnical engineer to interpret the report and develop earthwork and foundation recommendations and design parameters in which to base the contractor's design. If any additional subsurface investigation or laboratory analysis is required to better characterize the site or develop the final design, the Contractor shall perform it under the direction of a licensed geotechnical engineer. There will be no separate payment for the cost of additional tests. If differences between the Contractor's additional subsurface investigation and the government provided soils report or the reasonably expected conditions require material revisions in the design, an equitable adjustment may be made, in accordance with the provisions of the Differing Site Conditions clause. The basis for the adjustment would be the design and construction appropriate for the conditions described in the Government furnished report or the reasonably expected conditions, in comparison with any changes required by material differences in the actual conditions encountered, in accordance with the terms of contract clause Differing Site Conditions.

5.2.2.2. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal, as described in Section 01 33 16, *Design After Award*.

5.2.3. VEHICLE PAVEMENTS: (as applicable to the project)

5.2.3.1. Design procedures and materials shall conform to one of the following: 1) the USACE Pavement Transportation Computer Assisted Structural Engineering (PCASE) program, 2) American Association of State Highway and Transportation Officials (AASHTO) or, 3) the applicable state Department of Transportation standards in which the project is located. See paragraph 5.2.2.2 and Section 01 33 16 for required information for the Contractor's geotechnical evaluation report. The minimum flexible pavement section shall consist of 2 inches of asphalt and 6 inches of base or as required by the pavement design, whichever is greater, unless specifically identified by the Government to be a gravel road. Design roads and parking areas for a life expectancy of 25 years with normal maintenance. Parking area for tactical vehicles (as applicable to the project) shall be Portland Cement Concrete (PCC) rigid pavement design. For concrete pavements, submit joint layout plan for review and concurrence. Design pavements for military tracked vehicles (as applicable to the project) IAW USACE PCASE. Traffic estimates for each roadway area will be as shown on the drawings or listed in Section 01 10 00 Paragraph 6.4.4. Pavement markings and traffic signage shall comply with the Installation requirements and with the Manual on Uniform Traffic Control Devices.

5.2.3.2. Parking Requirements.

(a) All handicap POV parking lots (where applicable in the facility specific requirements) shall meet the ADA and ABA Accessibility Guidelines for accessible parking spaces.

(b) Design POV parking spaces for the type of vehicles anticipated, but shall be a minimum of 9 ft by 18 ft for POVs, except for two wheel vehicles.

5.2.3.3. Sidewalks. Design the network of walks throughout the complex (where applicable) to facilitate pedestrian traffic among facilities, and minimize the need to use vehicles. Incorporate sidewalks to enhance the appearance of the site development, while creating a sense of entry at the primary patron entrances to the buildings. Minimum sidewalk requirements are in Paragraph 3, where applicable and/or paragraph 6 and/or site plans, where applicable..

5.2.4. CATHODIC PROTECTION: Provide cathodic protection systems for all underground metallic systems and metallic fittings/portions of non-metallic, underground systems, both inside and outside the building 5 foot line that are subject to corrosion. Coordinate final solutions with the installation to insure an approach that is consistent with installation cathodic protection programs.

5.2.5. UTILITIES: See paragraph 6.4.6 for specific information on ownership of utilities and utility requirements. Meter all utilities (gas, water, and electric, as applicable) to each facility. For Government owned utilities, install meters that are wireless data transmission capable as well as have a continuous manual reading option. All meters will be capable of at least hourly data logging and transmission and provide consumption data for gas, water, and



electricity. Gas and electric meters will also provide demand readings based on consumption over a maximum of any 15 minute period. Configure all meters to transmit at least daily even if no receiver for the data is currently available at the time of project acceptance. For privatized utilities, coordinate with the privatization utility(ies) for the proper meter base and meter installation.

5.2.6. PERMITS: The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

5.2.7. IRRIGATION. Landscape irrigation systems, if provided, shall comply with the following:

5.2.7.1. Irrigation Potable Water Use Reduction. Reduce irrigation potable water use by 100 percent using LEED credit WE1.1 baseline (no potable water used for irrigation), except where precluded by other project requirements.

5.2.8. EPA WATERSENSE PRODUCTS AND CONTRACTORS. Except where precluded by other project requirements, use EPA WaterSense labeled products and irrigation contractors that are certified through a WaterSense labeled program where available.

### 5.3. ARCHITECTURE AND INTERIOR DESIGN:

This element will be evaluated per APPLICABLE CRITERIA under the quality focus.

5.3.1. STANDARDS AND CODES: The architecture and interior design shall conform to APPLICABLE CRITERIA.

5.3.2. GENERAL: Overall architectural goal is to provide a functional, quality, visually appealing facility that is a source of pride for the installation and delivered within the available budget and schedule.

5.3.3. COMPUTATION OF AREAS: See APPENDIX Q for how to compute gross and net areas of the facility(ies).

5.3.4. BUILDING EXTERIOR: Design buildings to enhance or compliment the visual environment of the Installation. Where appropriate, reflect a human scale to the facility. Building entrance should be architecturally defined and easily seen. When practical, exterior materials, roof forms, and detailing shall be compatible with the surrounding development and adjacent buildings on the Installation and follow locally established architectural themes. Use durable materials that are easy to maintain. Exterior colors shall conform to the Installation requirements. See paragraph 6.

5.3.4.1. Building Numbers: Permanently attach exterior signage on two faces of each building indicating the assigned building number or address. Building number signage details and locations shall conform to Appendix H, Exterior Signage.

### 5.3.5. BUILDING INTERIOR

5.3.5.1. Space Configuration: Arrange spaces in an efficient and functional manner in accordance with area adjacency matrices.

5.3.5.2. Surfaces: Appearance retention is the top priority for building and furniture related finishes. Provide low maintenance, easily cleaned room finishes that are commercially standard for the facility occupancy specified, unless noted otherwise.

5.3.5.3. Color: The color, texture and pattern selections for the finishes of the building shall provide an aesthetically pleasing, comfortable, easily maintainable and functional environment for the occupants. Coordinate the building colors and finishes for a cohesive design. Select colors appropriate for the building type. Use color, texture and pattern to path or way find through the building. Trendy colors that will become dated shall be limited to non-permanent finishes such as carpet and paint. Select finishes with regards to aesthetics, maintenance, durability, life safety and image. Limit the number of similar colors for each material. Use medium range colors for ceramic and porcelain tile grout to help hide soiling. Plastic laminate and solid surface materials shall have patterns that are mottled, flecked or speckled. Coordinate finish colors of fire extinguisher cabinets, receptacle bodies and plates, fire alarms / warning lights, emergency lighting, and other miscellaneous items with the building interior. Match color of equipment items on ceilings (speakers, smoke detectors, grills, etc.) the ceiling color.

5.3.5.4. Circulation: Circulation schemes must support easy way finding within the building.

5.3.5.5. Signage: Provide interior signage for overall way finding and life safety requirements. A comprehensive interior plan shall be from one manufacturer. Include the following sign types: (1) Lobby Directory, (2) Directional Signs; (3) Room Identification Signs; (4) Building Service Signs; (5) Regulatory Signs; (6) Official and Unofficial Signs (7) Visual Communication Boards (8) NO SMOKING signage that conveys building smoking policy. Use of emblems or logos may also be incorporated into the signage plan.

5.3.5.6. Window Treatment: Provide interior window treatments with adjustable control in all exterior window locations for control of day light coming in windows or privacy at night. Maintain uniformity of treatment color and material to the maximum extent possible within a building.

5.3.5.7. Casework: Unless, otherwise specified, all casework for Cabinetry and cases shall be "custom grade", as described in the AWI Quality Standards.

#### 5.3.6. COMPREHENSIVE INTERIOR DESIGN

5.3.6.1. Comprehensive Interior Design includes the integration of a Structural Interior Design (SID) and a Furniture, Fixtures and Equipment (FF&E) design and package. SID requires the design, selection and coordination of interior finish materials that are integral to or attached to the building structure. Completion of a SID involves the selection and specification of applied finishes for the building's interior features including, but not limited to, walls, floors, ceilings, trims, doors, windows, window treatments, built-in furnishings and installed equipment, lighting, and signage. The SID package includes finish schedules, finish samples and any supporting interior elevations, details or plans necessary to communicate the building finish design and build out. The SID also provides basic space planning for the anticipated FF&E requirements in conjunction with the functional layout of the building and design issues such as life safety, privacy, acoustics, lighting, ventilation, and accessibility. See Section 01 33 16 for SID design procedures.

5.3.6.2. The FF&E design and package includes the design, selection, color coordination and of the required furnishing items necessary to meet the functional, operational, sustainability, and aesthetic needs of the facility coordinated with the interior finish materials in the SID. The FF&E package includes the specification, procurement documentation, placement plans, ordering and finish information on all freestanding furnishings and accessories, and a cost estimate. Coordinate the selection of furniture style, function and configuration with the defined requirements. Examples of FF&E items include, but are not limited to workstations, seating, files, tables, beds, wardrobes, draperies and accessories as well as marker boards, tack boards, and presentation screens. Criteria for furniture selection include function and ergonomics, maintenance, durability, sustainability, comfort and cost. See Section 01 33 16 for FFE design procedures.

#### 5.4. STRUCTURAL DESIGN

5.4.1. STANDARDS AND CODES: The structural design shall conform to APPLICABLE CRITERIA.

5.4.2. GENERAL: The structural system must be compatible with the intended functions and components that allows for future flexibility and reconfigurations of the interior space. Do not locate columns, for instance, in rooms requiring visibility, circulation or open space, including, but not limited to entries, hallways, common areas, classrooms, etc. Select an economical structural system based upon facility size, projected load requirements and local availability of materials and labor. Base the structural design on accurate, site specific geotechnical information and anticipated loads for the building types and geographical location. Consider climate conditions, high humidity, industrial atmosphere, saltwater exposure, or other adverse conditions when selecting the type of cement and admixtures used in concrete, the concrete cover on reinforcing steel, the coatings on structural members, expansion joints, the level of corrosion protection, and the structural systems. Analyze, design and detail each building as a complete structural system. Design structural elements to preclude damage to finishes, partitions and other frangible, non-structural elements to prevent impaired operability of moveable components; and to prevent cladding leakage and roof ponding. Limit deflections of structural members to the allowable of the applicable material standard, e.g., ACI, AISC, Brick Industry Association, etc. When modular units or other pre-fabricated construction is used or combined with stick-built construction, fully coordinate and integrate the overall structural design between the two different or interfacing construction types. If the state that the project is located in requires separate, specific licensing for structural engineers (for instance, such as in Florida, California and others), then the structural engineer designer of record must be registered in that state.

5.4.3. LOADS: See paragraph 3 for facility specific (if applicable) and paragraph 6 for site and project specific structural loading criteria. Unless otherwise specified in paragraph 6, use Exposure Category C for wind. If not specified, use Category C unless the Designer of Record can satisfactorily justify another Exposure Category in its design analysis based on the facility Master Plan. Submit such exceptions for approval as early as possible and prior to the Interim Design Submittal in Section "Design After Award". Design the ancillary building items, e.g. doors, window jambs and connections, overhead architectural features, systems and equipment bracing, ducting, piping, etc. for gravity, seismic, lateral loads and for the requirements of UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings. Ensure and document that the design of glazed items includes, but is not limited to, the following items under the design loads prescribed in UFC 4-010-01:

- (a) Supporting members of glazed elements, e.g. window jamb, sill, header
- (b) Connections of glazed element to supporting members, e.g. window to header
- (c) Connections of supporting members to each other, e.g. header to jamb
- (d) Connections of supporting members to structural system, e.g. jamb to foundation.

5.4.4. TERMITE TREATMENT: (Except Alaska) Provide termite prevention treatment in accordance with Installation and local building code requirements, using licensed chemicals and licensed applicator firm.

## 5.5. THERMAL PERFORMANCE

5.5.1. STANDARDS AND CODES: Building construction and thermal insulation for mechanical systems shall conform to APPLICABLE CRITERIA.

5.5.2. BUILDING ENVELOPE SEALING PERFORMANCE REQUIREMENT. Design and construct the building envelope for office buildings, office portions of mixed office and open space (e.g., company operations facilities), dining, barracks and instructional/training facilities with a continuous air barrier to control air leakage into, or out of, the conditioned space. Clearly identify all air barrier components of each envelope assembly on construction documents and detail the joints, interconnections and penetrations of the air barrier components. Clearly identify the boundary limits of the building air barriers, and of the zone or zones to be tested for building air tightness on the drawings. The use of painted interior walls is not an acceptable air barrier method.

5.5.2.1. Trace a continuous plane of air-tightness throughout the building envelope and make flexible and seal all moving joints.

5.5.2.2. The air barrier material(s) must have an air permeance not to exceed 0.004 cfm / sf at 0.3" wg (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178

5.5.2.3. Join and seal the air barrier material of each assembly in a flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of these assemblies and components.

5.5.2.4. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement, or damage, and transfer the load to the structure.

5.5.2.5. Seal all penetrations of the air barrier. If any unavoidable penetrations of the air barrier by electrical boxes, plumbing fixture boxes, and other assemblies are not airtight, make them airtight by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly.

5.5.2.6. The air barrier must be durable to last the anticipated service life of the assembly.

5.5.2.7. Do not install lighting fixtures with ventilation holes through the air barrier

5.5.2.8. Provide a motorized damper in the closed position and connected to the fire alarm system to open on call and fail in the open position for any fixed open louvers at elevator shafts. Coordinate the motorized elevator hoistway vent damper(s) with the Fire Protection System design in paragraph 5.10. Ensure that the damper(s) is accessible to facilitate regular inspection and maintenance.

5.5.2.9. Damper and control to close all ventilation or make-up air intakes and exhausts, , etc., when leakage can occur during inactive periods. Atrium smoke exhaust and intakes shall only open when activated per IBC and other applicable Fire Code requirements.

5.5.2.10. Compartmentalize garages under buildings by providing air-tight vestibules at building access points.

5.5.2.11. Compartmentalize spaces under negative pressure such as boiler rooms and provide make-up air for combustion.

5.5.2.12. Performance Criteria and Substantiation: Submit the qualifications and experience of the testing entity for approval. Demonstrate performance of the continuous air barrier for the opaque building envelope by the following tests:

(a) Develop an Air Barrier Quality Control plan to assure that a competent air barrier inspector/specialist inspects the critical components prior to them being concealed. At a minimum, three onsite inspections are required during construction to assure the completeness of the construction and design.

(b) Test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed 0.25cfm/ft<sup>2</sup> at a pressure differential of 0.3" w.g.(75 Pa) in accordance with ASTM's E 779 (2003) or E-1827-96 (2002). Accomplish tests using both pressurization and depressurization.. Divide the volume of air leakage in cfm @ 0.3" w.g. (L/s @ 75 Pa) by the area of the pressure boundary of the building, including roof or ceiling, walls and floor to produce the air leakage rate in cfm/ft<sup>2</sup> @ 0.3" w.g. (L/s.m<sup>2</sup> @ 75 Pa). Do not test the building until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions so that repairs to the continuous air barrier, if needed to comply with the required air leakage rate, can be done in a timely manner.

(c) Test the completed building using Infrared Thermography testing. Use infrared cameras with a resolution of 0.1deg C or better. Perform testing on the building envelope in accordance with ISO 6781:1983 and ASTM C1060-90(1997). Determine air leakage pathways using ASTM E 1186-03 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems, and perform corrective work as necessary to achieve the whole building air leakage rate specified in (a) above.

(d) Notify the Government at least three working days prior to the tests to provide the Government the opportunity to witness the tests. Provide the Government written test results confirming the results of all tests.

## 5.6. PLUMBING

5.6.1. STANDARDS AND CODES: The plumbing system shall conform to APPLICABLE CRITERIA.

5.6.2. PRECAUTIONS FOR EXPANSIVE SOILS: Where expansive soils are present, include design features for underslab piping systems and underground piping serving chillers, cooling towers, etc, to control forces resulting from soil heave. Some possible solutions include, but are not necessarily limited to, features such as flexible expansion joints, slip joints, horizontal offsets with ball joints, or multiple bell and spigot gasketed fittings. For structurally supported slabs, suspend piping from the structure with adequate space provided below the pipe for the anticipated soil movement.

5.6.3. HOT WATER SYSTEMS: For Hot Water heating and supply, provide a minimum temp of 140 Deg F in the storage tank and a maximum of 110 Deg F at the fixture, unless specific appliances or equipment specifically require higher temperature water supply.

5.6.4. SIZING HOT WATER SYSTEMS: Unless otherwise specified or directed in paragraph 3, design in accordance with ASHRAE Handbook Series (appropriate Chapters), ASHRAE Standard 90.1, and the energy conservation requirements of the contract. Size and place equipment so that it is easily accessible and removable for repair or replacement.

5.6.5. JANITOR CLOSETS: In janitor spaces/room/closets, provide at minimum, a service sink with heavy duty shelf and wall hung mop and broom rack(s).

5.6.6. FLOOR DRAINS: As a minimum, provide floor drains in mechanical rooms and areas, janitor spaces/rooms/closets and any other area that requires drainage from fixtures or equipment, drain downs, condensate, as necessary.

5.6.7. URINALS: Not Used.

5.6.8. BUILDING WATER USE REDUCTION. Reduce building potable water use in each building 30 percent using IPC fixture performance requirements baseline.

5.6.9. Do not use engineered vent or Sovent® type drainage systems.

5.6.10. Where the seasonal design temperature of the cold water entering a building is below the seasonal design dew point of the indoor ambient air, and where condensate drip will cause damage or create a hazard, insulate plumbing piping with a vapor barrier type of insulation to prevent condensation. Do not locate water or drainage piping over electrical wiring or equipment unless adequate protection against water (including condensation) damage is provided. Insulation alone is not adequate protection against condensation. Follow ASHRAE Fundamentals Chapter 23, Insulation for Mechanical Systems, IMC paragraph 1107 and International Energy Conservation Code for pipe insulation requirements.

5.6.11. Cover all drain, waste and vent piping to prevent mortar or other debris from being flushed down and blocking pipes during such construction activities.

## 5.7. ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

5.7.1. STANDARDS AND CODES: The electrical systems for all facilities shall conform to APPLICABLE CRITERIA.

5.7.2. MATERIALS AND EQUIPMENT: Materials, equipment and devices shall, as a minimum, meet the requirements of Underwriters Laboratories (UL) where UL standards are established for those items. Wiring for branch circuits shall be copper. Motors larger than one-half horsepower shall be three phase. All electrical systems shall be pre-wired and fully operational unless otherwise indicated. Wall mounted electrical devices (power receptacles, communication outlets and CATV outlets) shall have matching colors, mounting heights and faceplates.

5.7.3. POWER SERVICE: Primary service from the base electrical distribution system to the pad-mounted transformer and secondary service from the transformer to the building service electrical equipment room shall be underground. See paragraph 6 for additional site electrical requirements.

5.7.3.1. Spare Capacity: Provide 10% space for future circuit breakers in all panelboards serving residential areas of buildings and 15% spaces in all other panelboards.

5.7.4. TELECOMMUNICATION SERVICE: Connect the project's facilities to the Installation telecommunications (voice and data) system through the outside plant (OSP) telecommunications underground infrastructure cabling system per the I3A Criteria. Connect to the OSP cabling system from each facility main cross connect located in the telecommunications room.

5.7.5. LIGHTING: Comply with the recommendations of the Illumination Engineering Society of North America (IESNA), the National Energy Policy Act and Energy Star requirements for lighting products..

### 5.7.5.1. Interior Lighting:

(a) Reflective Surfaces: Coordinate interior architectural space surfaces and colors with the lighting systems to provide the most energy-efficient workable combinations.

(b) High Efficiency Fluorescent Lighting: Utilize NEMA premium electronic ballasts and energy efficient fluorescent lamps with a Correlated Color Temperature (CCT) of 4100K. Linear fluorescent and compact fluorescent fixtures shall have a Color Rendering Index of (CRI) of 87 or higher. Fluorescent lamps shall be the low mercury type qualifying as non-hazardous waste upon disposal. Do not use surface mounted fixtures on acoustical tile ceilings. Provide an un-switched fixture with emergency ballast shall be provided at each entrance to the building.

(c) Solid State Lighting: Fixtures shall provide lighting with a minimum Correlated Color Temperature (CCT) of 4100K and shall have a Color Rendering Index of (CRI) of 75 or higher. Verify performance of the light producing solid state components by a test report in compliance with the requirements of IESNA LM 80. Verify performance of the solid state light fixtures by a test report in compliance with the requirements of IESNA LM 79. Provide lab results by a NVLAP certified laboratory. The light producing solid state components and drivers shall have a life expectancy of 50,000 operating hours while maintaining at least 70% of original illumination level. Provide a complete five year warranty for fixtures.

(d) Metal Halide Lighting (where applicable): Metal Halide lamp fixtures in the range of 150-500 Watts shall be pulse start type and have a minimum efficiency rating of 88%.

(e) Lighting Controls: ANSI/ASHRAE/IESNA 90.1 has specific lighting controls requirements. Provide a high level of lighting system control by individual occupants or by specific groups in multi-occupant spaces (classrooms, conference rooms) to promote the productivity, comfort and well being of the building occupants. In office spaces, the preferred lighting should be a 30 FC ambient lighting level with occupancy sensor controlled task lighting in the work spaces to provide a composite lighting level of 50 FC on the working surfaces. Consider incorporating daylighting techniques for the benefit of reducing lighting energy requirements while improving the quality of the indoor spaces. If daylight strategies are used, additional coordination is required with the architect and mechanical engineer. Additionally, incorporate electric lighting controls to take advantage of the potential energy savings.

(f) Exterior Lighting: See paragraph 6.9 for site specific information, if any, on exterior lighting systems. Minimize light pollution and light trespass by not over lighting and use cut-off type exterior luminaries.

5.7.6. TELECOMMUNICATION SYSTEM: Building telecommunications cabling systems (BCS) and OSP telecommunications cabling system shall conform to APPLICABLE CRITERIA, including but not limited to I3A Technical Criteria. An acceptable BCS encompasses, but is not limited to, copper and fiber optic (FO) entrance cable, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, workstation outlets, racks, cable management, patch panels, cable tray, cable ladder, conduits, grounding, and labeling.. Items included under OSP infrastructure encompass, but are not limited to, manhole and duct infrastructure, copper cable, fiber optic cable, cross connects, terminations, cable vaults, and copper and FO entrance cable.

5.7.6.1. Design, install, label and test all telecommunications systems in accordance with the I3A Criteria and ANSI/TIA/EIA 568, 569, and 606 standards. A Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) with at least 2 yrs related experience shall develop and stamp telecommunications design, and prepare the test plan. See paragraph 5.8.2.5 for design of environmental systems for Telecommunications Rooms.

5.7.6.2. The installers assigned to the installation of the telecommunications system or any of its components shall be regularly and professionally engaged in the business of the application, installation and testing of the specified telecommunications systems and equipment. Key personnel; i.e., supervisors and lead installers assigned to the installation of this system or any of its components shall be BICSI Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. In lieu of BICSI certification, supervisors and installers shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

5.7.6.3. Perform a comprehensive end to end test of all circuits to include all copper and fiber optic cables upon completion of the BCS and prior to acceptance of the facility. Provide adequate advanced notification to the COR to allow COR and Installation personnel attendance. The BCS circuits include but are not limited to all copper and fiber optic(FO) entrance cables, termination equipment, copper and fiber backbone cable, copper and fiber horizontal distribution cable, and workstation outlets. Test in accordance with ANSI/EIA/TIA 568 standards. Use test instrumentation that meets or exceeds the standard. Submit the official test report to include test procedures, parameters tested, values, discrepancies and corrective actions in electronic format. Test and accomplish all necessary corrective actions to ensure that the government receives a fully operational, standards based, code compliant telecommunications system.

5.7.7. LIGHTNING PROTECTION SYSTEM: Provide a lightning protection system where recommended by the Lightning Risk Assessment of NFPA 780, Annex L.

## 5.8. HEATING, VENTILATING, AND AIR CONDITIONING

5.8.1. STANDARDS AND CODES: The HVAC system shall conform to APPLICABLE CRITERIA.

5.8.2. DESIGN CONDITIONS.

5.8.2.1. Outdoor and indoor design conditions shall be in accordance with UFC 3-410-01FA. Outdoor air and exhaust ventilation requirements for indoor air quality shall be in accordance with ASHRAE 62.1. All Buildings with minimum LEED Silver requirement (or better) will earn LEED Credit EQ 7.1, Thermal Comfort-Design., except where precluded by other project requirements. Where the contract specifies indoor design temperature , airflow, humidity conditions, etc., use those parameters.

5.8.2.2. High Humidity Areas: Design HVAC systems in geographical areas meeting the definition for high humidity in UFC 3-410-01FA to comply with the special criteria therein for humid areas.

5.8.2.3. Cooling equipment may be oversized by up to 15 percent to account for recovery from night setback. Heating equipment may be oversized by up to 30 percent to account for recovery from night setback. Design single zone systems and multi-zone systems to maintain an indoor design condition of 50% relative humidity for cooling only. For heating only where the indoor relative humidity is expected to fall below 20% for extended periods, add humidification to increase the indoor relative humidity to 30%. Provide ventilation air from a separate dedicated air handling unit (DOAU) for facilities using multiple single zone fan-coil type HVAC systems. Do not condition outside air through fan coil units. Avoid the use of direct expansion cooling coils in air handling units with constant running fans that handle outside air.

5.8.2.4. Locate all equipment so that service, adjustment and replacement of controls or internal components are readily accessible for easy maintenance.

5.8.2.5. Environmental Requirements for Telecommunications Rooms and Telecommunications Equipment Rooms, (including SIPRNET ROOMS, where applicable for specific facility type). Comply with ANSI/EIA/TIA 569 (including applicable Addenda). Maintain environmental conditions at the Class 1 and 2 Recommended Operating Environment. Before being introduced into the room, filter and pre-condition outside air to remove particles with the minimum MERV filtration quality shown in the ASHRAE HVAC Applications, Chapter 17. Maintain rooms under positive pressure relative to surrounding spaces. Design computer room air conditioning units specifically for telecommunications room applications. Build and test units in accordance with the requirements of ANSI/ASHRAE Standard 127. A complete air handling system shall provide ventilation, air filtration, cooling and dehumidification, humidification (as determined during the design phase), and heating. The system shall be independent of other facility HVAC systems and shall be required year round.

5.8.2.6. Fire dampers: dynamic type with a dynamic rating suitable for the maximum air velocity and pressure differential to which the damper is subjected. Test each fire damper with the air handling and distribution system running.

5.8.3. BUILDING AUTOMATION SYSTEM. Provide a Building Automation System consisting of a building control network , and integrate the building control network into the UMCS as specified.

The building control network shall be a single complete non-proprietary Direct Digital Control (DDC) system for control of the heating, ventilating and air conditioning (HVAC) systems as specified herein. The building control network shall be an Open implementation of LONWORKS® technology using ANSI/EIA 709.1B as the only communications protocol and use only LonMark Standard Network Variable Types (SNVTs), as defined in the LonMark® Resource Files, for communication between DDC Hardware devices to allow multi-vendor interoperability.

5.8.3.1. The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This includes, but is not limited to the following:

- (a) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality.
- (b) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the

Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

5.8.3.2. All DDC Hardware shall:

- (a) Be connected to a TP/FT-10 ANSI/EIA 709.3 control network.
- (b) Communicate over the control network via ANSI/EIA 709.1B exclusively.
- (c) Communicate with other DDC hardware using only SNVTs
- (d) Conform to the LonMark® Interoperability Guidelines.
- (e) Be locally powered; link power (over the control network) is not acceptable.
- (f) Be fully configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself to support the application. All settings and parameters used by the application shall be configurable via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (*nci*), or hardware settings on the controller itself
- (g) Provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides) of the application. Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints and SNVT inputs for override of setpoints.
- (h) To the greatest extent practical, not rely on the control network to perform the application.
- (i) Provide on board nonvolatile memory for devices accumulating energy consumption.

5.8.3.3. Controllers shall be Application Specific Controllers whenever an ASC suitable for the application exists. When an ASC suitable for the application does not exist use programmable controllers or multiple application specific controllers.

5.8.3.4. Application Specific Controllers shall be LonMark Certified whenever a LonMark Certified ASC suitable for the application exists. For example, VAV controllers must be LonMark certified.

5.8.3.5. Application Specific Controllers (ASCs) shall be configurable via an LNS plug-in whenever t an ASC with an LNS plug-in suitable for the application exists.

5.8.3.6. Each scheduled system shall accept a network variable of type SNVT\_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule.

5.8.3.7. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling one and only one package unit.

5.8.3.8. Not Used

5.8.3.9. Perform all necessary actions needed to fully integrate the building control system. These actions include but are not limited to:

- Configure M&C Software functionality including: graphical pages for System Graphic Displays including overrides, alarm handling, scheduling, trends for critical values needing long-term or permanent monitoring via trends, and demand limiting.
- Install IP routers or ANSI/CEA-852 routers as needed to connect the building control network to the UMCS IP network. Routers shall be capable of configuration via DHCP and use of an ANSI/CEA-852 configuration server but shall not rely on these services for configuration. All communication between the UMCS and building networks shall be via the ANSI/CEA-709.1B protocol over the IP network in accordance with ANSI/CEA-852.

5.8.3.10. Provide the following to the Government for review prior to acceptance of the system:

- The latest version of all software and user manuals required to program, configure and operate the system.
- Points Schedule drawing that shows every DDC Hardware device. The Points Schedule shall contain the following information as a minimum:
  - Device address and NodeID.



- Input and Output SNVTs including SNVT Name, Type and Description.
- Hardware I/O, including Type (AI, AO, BI, BO) and Description.
- Alarm information including alarm limits and SNVT information.
- Supervisory control information including SNVTs for trending and overrides.
- Configuration parameters (for devices without LNS plug-ins) Example Points Schedules are available at <https://eko.usace.army.mil/fa/besc/>
- Riser diagram of the network showing all network cabling and hardware. Label hardware with ANSI.CEA-709.1 addresses, IP addresses, and network names.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.
- Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- LONWORKS® Network Services (LNS®) database for the completed system.
- Quality Control (QC) checklist (below) completed by the Contractor's Chief Quality Control (QC) Representative

**Table 5-1: QC Checklist**

Instructions: Initial each item, sign and date verifying that the requirements have been met.		
#	Description	Initials
1	All DDC Hardware is installed on a TP/FT-10 local control bus.	
2	Communication between DDC Hardware is only via EIA 709.1B using SNVTs. Other protocols and network variables other than SNVTs have not been used.	
3	All sequences are performed using DDC Hardware.	
4	LNS Database is up-to-date and accurately represents the final installed system	
5	All software has been licensed to the Government	
6	M&C software monitoring displays have been created for all building systems, including all override and display points indicated on Points Schedule drawings.	
7	Final As-built Drawings accurately represent the final installed system.	
8	O&M Instructions have been completed and submitted.	
9	Connections between the UMCS IP network and ANSI/CEA-709.1B building networks are through ANSI/CEA-852 Routers.	
By signing below I verify that all requirements of the contract, including but not limited to the above, been met.		
Signature: _____ Date: _____		

5.8.3.11. Perform a Performance Verification Test (PVT) under Government supervision prior to system acceptance. During the PVT demonstrate that the system performs as specified, including but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

5.8.3.12. Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition.

5.8.3.13. Provide training at the project site on the installed building system. Upon completion of this training each student, using appropriate documentation, should be able to start the system, operate the system, recover the system after a failure, perform routine maintenance and describe the specific hardware, architecture and operation of the system.

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5.8.4. TESTING, ADJUSTING AND BALANCING. Test and balance air and hydronic systems, using a firm certified for testing and balancing by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing Adjusting, and Balancing Bureau (TABB). The prime contractor shall hire the TAB firm directly, not through a subcontractor. Perform TAB in accordance with the requirements of the standard under which the TAB Firm's qualifications are approved, i.e., AABC MN-1, NEBB TABES, or SMACNA HVACTAB unless otherwise specified herein. All recommendations and suggested practices contained in the TAB Standard shall be

considered mandatory. Use the provisions of the TAB Standard, including checklists, report forms, etc., as nearly as practicable to satisfy the Contract requirements. Use the TAB Standard for all aspects of TAB, including qualifications for the TAB Firm and Specialist and calibration of TAB instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the TAB Standard, adhere to the manufacturer's recommendations. All quality assurance provisions of the TAB Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the TAB Standard, the TAB Specialist shall develop TAB procedures. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the TAB Standard used (AABC, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements are mandatory.

5.8.5. COMMISSIONING: Commission all HVAC systems and equipment, including controls, and all systems requiring commissioning for LEED Enhanced commissioning, in accordance with ASHRAE Guideline 1.1, ASHRAE Guideline 0 and LEED. Do not use the sampling techniques discussed in ASHRAE Guideline 1.1 and in ASHRAE Guideline 0. Commission 100% of the HVAC controls and equipment. Hire the Commissioning Authority (CxA), certified as a CA by AABC, NEBB, or TABB, as described in Guideline 1.1. The CxA will be an independent subcontractor and not an employee of the Contractor nor an employee or subcontractor of any other subcontractor on this project, including the design professionals (i.e., the DOR or their firm(s)). The CxA will communicate and report directly to the Government in execution of commissioning activities. The Contracting Officer's Representative will act as the Owner's representative in performance of duties spelled out under OWNER in Annex F of ASHRAE Guideline 0. Because required CA contractual relationship may not be acceptable to GBCI for LEED certification, the project cannot earn LEED Credit EA3 Enhanced Commissioning. However, still complete, maintain and provide copies of all necessary LEED documentation for Credit EA 3. This LEED Credit cannot be included to meet the required LEED rating for this project. Contractor may attempt this as an additional credit for GBCI certification but the Government will not accept it until GBCI accepts it.

## 5.9. ENERGY CONSERVATION

5.9.1. The building including the building envelope, HVAC systems, service water heating, power, and lighting systems shall meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.2. Design all building systems and elements to meet the minimum requirements of ANSI/ASHRAE/IESNA 90.1. Design the buildings, including the building envelope, HVAC systems, service water heating, power, and lighting systems to achieve an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHRAE/IESNA Standard 90.1. Energy calculation methodologies and substantiation requirements are defined in Section 01 33 16, Design After Award.

5.9.3. Purchase Energy Star products, except use FEMP designated products where FEMP is applicable to the type product. The term "Energy Star product" means a product that is rated for energy efficiency under an Energy Star program. The term "FEMP designated product" means a product that is designated under the Federal Energy Management Program of the Department of Energy as being among the highest 25 percent of equivalent products for energy efficiency. When selecting integral sized electric motors, choose NEMA PREMIUM type motors that conform to NEMA MG 1, minimum Class F insulation system. Motors with efficiencies lower than the NEMA PREMIUM standard may only be used in unique applications that require a high constant torque speed ratio (e.g., inverter duty or vector duty type motors that conform to NEMA MG 1, Part 30 or Part 31).

5.9.4. Solar Hot Water Heating. Provide at least 30% of the domestic hot water requirements through solar heating methodologies, unless the results of a Life Cycle Cost Analysis (LCCA) developed utilizing the Building Life Cycle Cost Program (BLCC) which demonstrates that the solar hot water system is not life cycle cost effective in comparison with other hot water heating systems. The type of system will be established during the contract or task order competition and award phase, including submission of an LCCA for government evaluation to justify non-selection of solar hot water heating. The LCCA uses a study period of 25 years and the Appendix K utility cost information. The LCCA shall include life cycle cost comparisons to a baseline system to provide domestic hot water without solar components, analyzing at least two different methodologies for providing solar hot water to compare against the baseline system.

5.9.5. Process Water Conservation. When potable water is used to improve a building's energy efficiency, employ lifecycle cost effective water conservation measures, except where precluded by other project requirements.

5.9.6. Renewable Energy Features. The Government's goal is to implement on-site renewable energy generation for Government use when lifecycle cost effective. See Paragraph 6, PROJECT SPECIFIC REQUIREMENTS for renewable energy requirements for this project.

## 5.10. FIRE PROTECTION

5.10.1. STANDARDS AND CODES Provide the fire protection system conforming to APPLICABLE CRITERIA.

5.10.2. Inspect and test all fire suppression equipment and systems, fire pumps, fire alarm and detection systems and mass notification systems in accordance with the applicable NFPA standards. The fire protection engineer of record shall witness final tests. The fire protection engineer of record shall certify that the equipment and systems are fully operational and meet the contract requirements. Two weeks prior to each final test, the contractor shall notify, in writing, the installation fire department and the installation public work representative of the test and invite them to witness the test.

5.10.3. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets and locations for hanging portable fire extinguishers in accordance with NFPA 10 Standard for Portable Fire Extinguishers. The Government will furnish and install portable fire extinguishers, which are personal property, not real property installed equipment.

5.10.4. Fire alarm and detection system: Required fire alarm and detection systems shall be the addressable type. Fire alarm initiating devices, such as smoke detectors, heat detectors and manual pull stations shall be addressable. When the system is in alarm condition, the system shall annunciate the type and location of each alarm initiating device. Sprinkler water flow alarms shall be zoned by building and by floor. Supervisory alarm initiating devices, such as valve supervisory switches, fire pump running alarm, low-air pressure on dry sprinkler system, etc. shall be zoned by type and by room location.

5.10.5. Roof Access: Paragraph 2-9 of UFC 3-600-01 Fire Protection for Facilities will be modified in the next update to that UFC. Pending revision, comply with roof access and stairway requirements in accordance with the International Building Code. Where roof access is required by the IBC or other criteria, comply with UFC 4-010-01, Anti-Terrorist Force Protection, Standard 14. "Roof Access".

5.10.6. Fire Protection Engineer Qualifications: In accordance with UFC 3-600-01, FIRE PROTECTION ENGINEERING FOR FACILITIES, the fire protection engineer of record shall be a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), or a registered P.E. in a related engineering discipline with a minimum of 5 years experience, dedicated to fire protection engineering that can be verified with documentation.

## 5.11. SUSTAINABLE DESIGN

5.11.1. STANDARDS AND CODES: Sustainable design shall conform to APPLICABLE CRITERIA. See paragraph 6, PROJECT-SPECIFIC REQUIREMENTS for which version of LEED applies to this project. The LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects (AGMBC) applies to all projects. Averaging may be used for LEED compliance as permitted by the AGMBC but is restricted to only those buildings included in this project. Each building must individually comply with the requirements of paragraphs ENERGY CONSERVATION and BUILDING WATER USE REDUCTION.

5.11.2. LEED RATING, REGISTRATION, VALIDATION AND CERTIFICATION: See Paragraph PROJECT-SPECIFIC REQUIREMENTS for project minimum LEED rating/achievement level, for facilities that are exempt from the minimum LEED rating, for LEED registration and LEED certification requirements and for other project-specific information and requirements.

5.11.2.1. Innovation and Design Credits. LEED Innovation and Design (ID) credits are acceptable only if they are supported by formal written approval by GBCI (either published in USGBC Innovation and Design Credit Catalog or accompanied by a formal ruling from GBCI). LEED ID credits that require any Owner actions or commitments are acceptable only when Owner commitment is indicated in paragraph PROJECT-SPECIFIC REQUIREMENTS or Appendix LEED Project Credit Guidance

5.11.3. OPTIMIZE ENERGY PERFORMANCE. : Project must earn, as a minimum, the points associated with compliance with paragraph ENERGY CONSERVATION. LEED documentation differs from documentation

requirements for paragraph ENERGY CONSERVATION and both must be provided. For LEED-NC v2.2 projects you may substitute ASHRAE 90.1 2007 Appendix G in its entirety for ASHRAE 90.1 2004 in accordance with USGBC Credit Interpretation Ruling dated 4/23/2008.

5.11.4. COMMISSIONING. See paragraph 5.8.5 COMMISSIONING for commissioning requirements. USACE templates for the required Basis of Design document and Commissioning Plan documents are available at <http://en.sas.usace.army.mil> (click on Engineering Criteria) and may be used at Contractor's option.

5.11.5. DAYLIGHTING. Except where precluded by other project requirements, do the following in at least 75 percent of all spaces occupied for critical visual tasks: achieve a 2 percent glazing factor (calculated in accordance with LEED credit EQ8.1) OR earn LEED Daylighting credit, provide appropriate glare control and provide either automatic dimming controls or occupant-accessible manual lighting controls.

5.11.6. LOW-EMITTING MATERIALS. Except where precluded by other project requirements, use materials with low pollutant emissions, including but not limited to composite wood products, adhesives, sealants, interior paints and finishes, carpet systems and furnishings,

5.11.7. CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT. Except where precluded by other project requirements, earn LEED credit EQ 3.1 Construction IAQ Management Plan, During Construction and credit EQ 3.2 Construction IAQ Management Plan, Before Occupancy.

5.11.8. RECYCLED CONTENT. In addition to complying with section RECYCLED/RECOVERED MATERIALS, earn LEED credit MR4.1, Recycled Content, 10 percent except where precluded by other project requirements.

5.11.9. BIOBASED AND ENVIRONMENTALLY PREFERABLE PRODUCTS. Except where precluded by other project requirements, use materials with biobased content, materials with rapidly renewable content, FSC certified wood products and products that have a lesser or reduced effect on human health and the environment over their lifecycle to the maximum extent practicable.

5.11.10. FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM (FB4P). The Farm Security and Rural Investment Act (FSRIA) of 2002 required the U.S. Department of Agriculture (USDA) to create procurement preferences for biobased products that are applicable to all federal procurement (to designate products for biobased content). For all designated products that are used in this project, meet USDA biobased content rules for them except use of a designated product with USDA biobased content is not required if the biobased product (a) is not available within a reasonable time, (b) fails to meet performance standard or (c) is available only at an unreasonable price. For biobased content product designations, see <http://www.biopreferred.gov/ProposedAndFinalItemDesignations.aspx>.

5.12. CONSTRUCTION AND DEMOLITION (C&D) WASTE MANAGEMENT: Achievement of 50% diversion, by weight, of all non-hazardous C&D waste debris is required. Reuse of excess soils, recycling of vegetation, alternative daily cover, and wood to energy are not considered diversion in this context, however the Contractor must track and report it. A waste management plan and waste diversion reports are required, as detailed in Section 01 57 20.00 10, ENVIRONMENTAL PROTECTION.

5.13. SECURITY (ANTI-TERRORISM STANDARDS): Unless otherwise specified in Project Specific Requirements, only the minimum protective measures as specified by the current Department of Defense Minimum Antiterrorism Standards for Buildings, UFC 4-010-01, are required for this project. The element of those standards that has the most significant impact on project planning is providing protection against explosives effects. That protection can either be achieved using conventional construction (including specific window requirements) in conjunction with establishing relatively large standoff distances to parking, roadways, and installation perimeters or through building hardening, which will allow lesser standoff distances. Even with the latter, the minimum standoff distances cannot be encroached upon. These setbacks will establish the maximum buildable area. All standards in Appendix B of UFC 4-010-01 must be followed and as many of the recommendations in Appendix C that can reasonably be accommodated should be included. The facility requirements listed in these specifications assume that the minimum standoff distances can be met, permitting conventional construction. Lesser standoff distances (with specific minimums) are not desired, however can be provided, but will require structural hardening for the building. See Project Specific Requirements for project specific siting constraints. The following list highlights the major points but the detailed requirements as presented in Appendix B of UFC 4-010-01 must be followed.

(a) Standoff distance from roads, parking and installation perimeter; and/or structural blast mitigation

- (b) Blast resistant windows and skylights, including glazing, frames, anchors, and supports
- (c) Progressive collapse resistance for all facilities 3 stories or higher. Unless determined otherwise by the Installation and noted in paragraphs 3 or 6, the building shall be considered to have areas of uncontrolled public access when designing for progressive collapse.
- (d) Mass notification system (shall also conform to UFC 4-021-01, Mass Notification Systems)
- (e) For facilities with mailrooms (see paragraph 3 for applicability) – mailrooms have separate HVAC systems and are sealed from rest of building

## **6.0 PROJECT SPECIFIC REQUIREMENTS**

### **6.1. GENERAL**

The requirements of this paragraph augment the requirements indicated in Paragraphs 3 through 5.

### **6.2. APPROVED DEVIATIONS**

The following are approved deviations from the requirements stated in Paragraphs 3 through 5 that only apply to this project.

There are no approved deviations from the requirements stated in paragraphs 1 through 5 (deviations that require official waiver approval). See paragraphs 6.3 through 6.18 for project specific criteria which supplements paragraphs 1 through 5.

### **6.3. SITE PLANNING AND DESIGN**

#### **6.3.1. General:**

See 3.2 SITE PLANNING AND DESIGN & 5.1 SITE PLANNING AND DESIGN

#### **SITE LOCATION:**

The site is located in the southwest corner of the cantonment area near gate 1 (I-77 exit 10). The site is approximately 7-8 acres and is bounded by Washington Road to the north, Hall Street to the south and west, and Foster Street to the east. See appendix AA.

#### **6.3.2. Site Structures and Amenities**

See 3.2 SITE PLANNING AND DESIGN, 5.1 SITE PLANNING AND DESIGN, & 5.2 SITE ENGINEERING

(a) Provide complete pedestrian and vehicular circulation system. Vehicular pavements shall accommodate POVs, warehouse delivery trucks, emergency vehicles and dumpster service vehicle.

(b) Dumpster Enclosure Area: The Contractor shall locate, design, and construct the dumpster enclosure area(s) and screening. Dumpster screening shall be aesthetically and architecturally compatible with the building it serves and shall be designed in accordance with the Installation Design Guide (Appendix DD). Locate the dumpster areas in accordance with UFC 4-010-01 "DoD Minimum Antiterrorism Standards for Buildings". Position the GFGI dumpsters outside of restricted areas to allow for servicing activities. The GFGI dumpsters(both trash and recycling) will consist of two front loading type- standard 8 cubic yards trash dumpsters and one side-loading type - standard 8 cubic yard recycling dumpster. The recycling dumpster is for cardboard only. See paragraph 5.1 for additional requirements.

(c) This facility includes a loading dock. Also see paragraph 6.5.2.5 i.

(d) Provide POV parking spaces for 70 percent of the personnel, but not less 30 spaces. POV spaces shall include ADA compliant parking spaces.

- (e) Provide a bus drop-off and parking area for one bus.

### 6.3.3. Site Functional Requirements:

#### 6.3.3.1. Stormwater Management (SWM) Systems.

(a) The D/B Contractor is required to comply with all rules and regulations pertaining to water quality and quantity found within the latest edition of the Fort Jackson Land Disturbance Handbook as well as those set forth by the South Carolina Department of Health and Environmental Control (SCDHEC).

(b) Low-impact development (LID) techniques should be considered as a priority by the D/B Contractor unless site conditions restrict the use of such techniques.

(c) All storm drainage pipes shall have adequate cover. Under no circumstance shall storm drainage pipes fall within the pavement section.

(d) All storm drainage pipes underneath the pavement and vehicular/emergency sidewalks shall be concrete with water tight joints and shall be designed to handle vehicular loading conditions as appropriate.

(e) The Storm Water Pollution Prevention Plan (SWPPP) shall conform to NPDES. The D/B Contractor shall provide and maintain his pollution prevention plan throughout the duration of the contract. The D/B Contractor is responsible for the design and construction of storm water detention, soil and erosion control measures, and the design of the storm drainage system within the designated construction area.

(f) The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

(g) See appendices PP, RR and QQ For Land Disturbance Handbook, Fort Jackson Guidance for Permits, and SWPPP Checklist.

#### 6.3.3.2. Erosion and Sediment Control

(a) The D/B Contractor is responsible for erosion and sediment control and for drainage of the entire site within the limits of construction.

(b) Construction is required to meet all temporary and permanent erosion prevention and sediment control requirements as found in the Fort Jackson Land Disturbance Handbook.

(c) Erosion control measures must be located within the limits of construction. Erosion control measures must be laid out such that each measure can be maintained without going outside the limits of construction.

(d) Erosion and sediment control plans shall take into account any offsite storm water that drains onto the proposed site.

(e) The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

(f) It is the Contractor's responsibility to provide all inspections necessary to comply with and maintain all necessary permits. It is the Contractor's responsibility to close all permits at contract completion.

#### 6.3.3.3. Vehicular Circulation.

See 5.1 SITE PLANNING AND DESIGN

Vehicular circulation areas shall include POV parking, warehouse delivery access and service drives, emergency vehicle access, and dumpster access.

### 6.4. SITE ENGINEERING

#### 6.4.1. Existing Topographical Conditions

A topographic and utility survey has been completed for the site and is included as part of this contract in Appendix AA.

The survey was conducted by SEPI ENGINEERING GROUP, INC.

Old Aerial photos of the site are provided in Appendix NN. These provide an indication of previous uses and structures no longer visible on the site.

#### 6.4.2. Existing Geotechnical conditions: See Appendix A for a preliminary geotechnical report.

See Paragraph 5.2.2 A soils investigation has been completed for the site and is included as part of this contract in Appendix A.

Prepared for: SEPI Engineering and Construction, Charlotte, North Carolina

Prepared by: Terracon Consultants, Inc., Columbia, South Carolina

Particular attention is to be directed toward the Geotechnical Engineering Report (Terracon Project No. 73105046, Dated August 23, 2010) including but not limited to Section 4.0. Coordination between the Geotechnical Engineer of Record and the Structural Engineer of Record concerning foundation support systems and geotechnical remediation of the subsurface conditions is required. Consider continuous mat or a series of isolated mat foundations to mitigate geotechnical differential settlements mentioned in the geotechnical report.



6.4.3. Fire Flow Tests See Appendix D for results of fire flow tests to use for basis of design for fire flow and domestic water supply requirements.

FIRE FLOW TESTS ARE PROVIDED BY PALMETTO STATE UTILITY SERVICES (PSUS).

Fire flow tests performed by Palmetto State Utility Services (PSUS) are provided in Appendix D.

6.4.4. Pavement Engineering and Traffic Estimates:

See 5.2 SITE ENGINEERING for vehicle pavement information.

Pavements shall be designed to accommodate heavy weight vehicles associated with warehouse delivery and dumpster service.

6.4.5. Traffic Signage and Pavement Markings

Provide complete traffic control signage and pavement markings in accordance with Fort Jackson standards in the sign guide in Appendix H as modified by updated criteria reference in paragraph 4.1. The criteria reference given in the Appendix H sign guide is outdated. Use the more current version of the MUTCD criteria listed in paragraph 4.1.

6.4.6. Base Utility Information

Information on existing site utilities is contained in Appendix AA - EXISTING CONDITIONS TOPOGRAPHIC SURVEY. The information on the topographic survey supersedes the information on the base utility maps. The base utility maps are provided for information on utilities beyond the extents of the survey.

Old Aerial photos of the site are provided in Appendix NN. These provide an indication of previous uses and structures no longer visible on the site.

6.4.6.1 The D/B Contractor is responsible for providing all site utilities and associated appurtenances, including but not limited to meters, backflow preventers, valves, pressure reducing valves and post indicator valves as needed for the facilities as described herein.

6.4.6.2 Utilities Permits:

The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

6.4.6.3 Utilities Metering:

See Paragraph 5.2.5

All meters shall interface with the building and Post UMCS. The building UMCS communicates to the Base station, Honeywell EBI, via radio (wireless transceiver) operating in the 2.4 GHz bands, commonly referred to as IEEE 802.11b/g. All meters shall have a pulse output compatible with this system.

6.4.6.4 Conflicts: Any existing utility that presents a conflict with the construction of the proposed improvements shall be brought to the attention of the utility owner. The D/B Contractor is responsible for resolving the conflict as needed in order to construct the proposed improvements of this project and maintain the surrounding utilities and services. Utilities shall not be located under or over buildings.

6.4.6.5 Coordination Meetings: Prior to the start of construction, the D/B Contractor shall conduct utility coordination meetings with the COR, PSUS and Fort Jackson's DPW. Utility contact information is provided in the following paragraphs. The D/B Contractor shall use the coordination meetings to identify utility lines impacted by project construction and verify working status of the existing lines. The D/B Contractor shall coordinate the proposed work on impacted utility lines with the appropriate utility owner. Utility impacts to be coordinated shall include, but are not limited to, removals, temporary service then removal, and permanent relocations, where applicable.

6.4.6.6 Connections and Outages: The D/B Contractor is responsible for coordinating with utility owners regarding utility connections and outages. The D/B Contractor is required to coordinate with PSUS within 14 days of notice to proceed for temporary construction water services. Specific utility outages required by the D/B Contractor shall be coordinated a minimum of seventy-eight (78) hours in advance through the COR.

#### 6.4.6.7 Maps of Existing Utilities:

Base utility maps of existing utilities are provided in Appendix AA.

Existing capacities are not included with this RFP. Existing capacities are expected to be adequate to support project development.

#### 6.4.6.8 Central Energy Plant (CEP)

Cooling for the facility shall be provided via chilled water supplied from Central Energy Plant (CEP) 3, building 1699, which is located on Washington Road approximately 1500 feet east of the site. Chilled water mains exit CEP 3 on the west side, then run east along Washington Road and north along Lee Road. The mains are 18 inch direct-buried steel piping from CEP 3 to pit 158, which is located east of CEP 3 on Washington Road. See the drawing in Appendix AA for additional information.

CEP 3 has ample cooling capacity for the addition of the Training Support Center. Chilled water is produced at 45 degrees F and returned at 55 degrees F in this system. The chilled water distribution system from CEP 3 uses primary/secondary pumping. Provide new tertiary chilled water pumps in the mechanical room of this facility. Coordinate design with existing CEP operational parameters to ensure that the required chilled water flow is provided to the Training Support Center under all conditions and such that chilled water flow to other facilities served by CEP 3 is not disrupted.

Provide direct-buried prefabricated pre-insulated chilled water piping from existing chilled water distribution piping outside CEP 3 to the new building. Carrier piping shall be steel; no other material is acceptable.

Hot water for building heating will not be provided from CEP 3; heating hot water will be provided locally by a new gas-fired boiler in the new facility.

See paragraph 6.11.6.1 for additional information.

#### 6.4.6.9 Site Electrical Utility:

The existing primary power distribution system at Fort Jackson is an 8320/4800V, three phase, four wire, grounded wye system. The primary system is owned, managed, and maintained by the Fort Jackson DPW. Contractor shall provide primary service and secondary service from connection point to the facility. Power for buildings will be provided from distribution transformers. Contractor shall be responsible for designing and providing the distribution pad-mounted transformer, transformer pad, electric metering, primary feeder from the connection point to the transformer, and secondary feeder from the transformer to the facility. The Contractor shall coordinate closely with the DPW and the COR. Contact Georges Dib, DPW at (803) 751-3823, for electric requirements. See paragraph entitled 6.9 SITE ELECTRICAL and TELECOMMUNICATIONS SYSTEMS for more information.

#### 6.4.6.10 Water distribution:

The water distribution system at Fort Jackson is a combined system, including domestic water and fire protection water. The water distribution systems are privatized and are owned by Palmetto State Utility Services (PSUS). The D/B Contractor shall be responsible for the design and construction of new water infrastructure, in accordance with PSUS Construction Standards, Material Guidelines, Installation Specifications, Standard Construction Drawings and the requirements of the South Carolina Department of Health and Environmental Control, to the project site and to within 5' of the facility. See Appendix KK and LL for PSUS Standards and procedures. Utility information shall be coordinated and planned with PSUS, Fort Jackson's DPW and the COR. Tap, New Project, and Inspection fees, payable to PSUS, will be applicable for site water and sanitary sewer facilities up the 5' building line by the D/B Contractor. Contact David Wiman, PSUS, at (803) 790-7288, for water requirements.

- (a) The design and construction and connection to existing utilities shall be coordinated through Palmetto State Utility Services.
- (b) The D/B Contractor is responsible for the design and adequate sizing of the potable water and fire systems.
- (c) Provide a complete water service system, including all piping, valves, connections, back flow preventers and appurtenances.
- (d) The water utility has existing points of connection available on and/or adjacent to the project site. See Appendix AA.
- (e) The use of PVC piping is acceptable for the potable water system.
- (f) The existing potable water system is high pressure and it should be anticipated that pressure reducing valves will be required for all potable water and fire system services lines.
- (h) Cross Connection Control: All local site specific requirements for cross connection control / backflow prevention shall be followed. The D/B Contractor shall be responsible for connection at the 5 foot line from the building.
- (i) Installation of potable water utilities from the point of connection to the 5 foot demarcation line of facilities shall be subject to tap, new project (engineering design review, operational evaluation, and operational support), and inspection fees payable to PSUS by the D/B Contractor. These fees shall be included as separate line items in the Contractor's bid and PSUS's proposal breakdown shall be provided to the Government upon request. PSUS requests the submission of a site plan containing the layout of water utilities and a minimum of 14 days time to provide pricing.

#### 6.4.6.11 FIRE WATER

All existing and new fire hydrants on site will be painted chrome yellow and the top of the hydrant will be painted in accordance with NFPA 291: 5.1 Classification of Hydrants. Hydrants shall be classified in accordance with their rated capacities [at 20 psi (1.4 bar) residual pressure or other designated value] as follows: (1) Class AA – Light Blue-Rated capacity of 1500 gpm (5680 L/min) or greater (2) Class A – Green-Rated capacity of 1000-1499 gpm (3785-5675 L/min) (3) Class B – Orange-Rated capacity of 500-999 gpm (1900-3780 L/min) (4) Class C – Red-Rated capacity of less than 500 gpm (1900 L/min). This paint scheme takes precedence over the one in the Fort Jackson Installation Design Guide. The IDG is found in Appendix DD.

- (b) Fort Jackson water and fire water distribution systems are combined. The D/B Contractor is responsible for providing fire water distribution from the point of connection to the facility. The D/B Contractor is required to provide Backflow Preventers, Post Indicator Valves and Fire Department Connections for the building in an approved DPW location.

#### 6.4.6.12 Sewer

Sanitary distribution systems are privatized and are owned by Palmetto State Utility Services (PSUS). The D/B Contractor shall be responsible for the design and construction of new wastewater infrastructure, in accordance with PSUS Construction Standards, Material Guidelines, Installation Specifications, Standard Construction Drawings and the requirements of the South Carolina Department of Health and Environmental Control, to the project site and to within 5' of the facility. See Appendix KK and LL for PSUS Standards and procedures. Utility information shall be coordinated and planned with PSUS, Fort Jackson's DPW and the COR. Tap, New Project, and Inspection fees, payable to PSUS, will be applicable for site water and sanitary sewer facilities up the 5' building line by the D/B Contractor. Contact David Wiman, PSUS, at (803) 790-7288, for water and sanitary requirements.

- (a) The design, construction and connection to existing utilities shall be coordinated through Palmetto State Utility Services.
- (b) The D/B Contractor is responsible for the design and adequate sizing of the sanitary sewer systems.
- (c) The sanitary sewer system has an existing point of connection available on and/or adjacent to the project site. See Appendix AA.
- (d) The use of PVC piping is acceptable for sanitary sewer systems.

(e) Installation of sanitary sewer utilities from the point of connection to the 5 foot demarcation line of facilities shall be subject to tap, new project (engineering design review, operational evaluation, and operational support), and inspection fees payable to PSUS by the D/B Contractor. These fees shall be included as separate line items in the Contractor's bid and PSUS's proposal breakdown shall be provided to the Government upon request. PSUS requests the submission of a site plan containing the layout of sanitary sewer utilities and a minimum of 14 days time to provide pricing.

(f) Provide a complete and functional sanitary sewer system, including all piping and appurtenances.

(f) Sewer is treated off-post by the City of Columbia Waste Water Treatment Plant (WWTP). Adequate capacity of the treatment plant is to be assumed by the designer.

(g) Two-way sanitary cleanouts shall be provided 5 feet outside of the building perimeter for all sewer mains exiting any building in accordance with the International Plumbing Code requirements. Align this cleanout to represent the physical demarcation of the 5' line.

#### 6.4.6.13 Gas:

The natural gas system is owned and operated by Fort Jackson. A 6 inch natural gas line runs along Washington Road just north of the site. See drawings in Appendix A for additional information. Existing gas lines in this area of Fort Jackson are black steel and have a protective coating that has been tested to be 15% ACM (non-friable). If any removal, modification, or disturbance of this material is required, the D/B Contractor shall abate this material per SCDHEC regulations at no additional cost to the Government.

(b) The D/B Contractor is responsible for coordinating the natural gas service connection with the Installation and providing an adequately sized service line for the project. PVC shall not be used for natural gas piping. The Government-preferred method of connection is a hot tap. Carlos Alexander, DPW, at (803) 751-1069, is the point of contact at Fort Jackson for natural gas service connections.

All natural gas burning equipment used in this project shall be capable of burning a liquid propane/air mixture as a backup fuel source.

#### 6.4.6.14 Site Telecommunications Utility:

Design and construction of ANY TELECOMMUNICATION systems shall be provided by the Contractor in coordination with Fort Jackson's Network Enterprise Center (NEC). The D/B Contractor shall be responsible for conduit and cable routing from the service connection point to the facility. Conduit and cabling from this connection point into the facility's main telecommunication room shall be designed and provided by the Contractor. The telecommunications design shall be coordinated with and approved by the U.S. Army Signal Network Enterprise Center (NEC) Quality Assurance Officer prior to construction. The contractor shall coordinate closely with NEC, DPW and the COR. Contact Eric Gibeaut, NEC at (803) 751-6543, for telecommunications requirements. See paragraph entitled 6.9 SITE ELECTRICAL and TELECOMMUNICATIONS SYSTEMS for more information.

#### 6.4.6.15 Site Cable TV (CATV) Utility:

CATV is privatized and will be provided by Time Warner. Design and service to the facility will be provided by Time Warner after contract completion. Contractor shall provide empty conduit with pull wire from the main telecommunications room to point of connection. Time Warner will provide the cable from the specified point of demarcation into the main telecommunications room. All exterior CATV work shall be coordinated with Ft. Jackson DPW, NEC and Time Warner. See paragraph entitled 6.9 SITE ELECTRICAL and TELECOMMUNICATIONS SYSTEMS for more information.

#### 6.4.7. Cut and Fill

All efforts should be made to minimize cut and fill quantities for the project by utilizing the existing grading features when possible. Retaining walls and maximum cut/fill slopes as determined per a geotechnical investigation can be used to achieve minimum cut and fill.

Cut and fill operations shall conform to Army requirement for 50% diversion rate. Exterior finish grades adjacent to the new building will be a minimum of six (6) inches below finished floor except where grades are required on walk ways and entrances to buildings that are handicap accessible. Finished grades shall slope away from the building at 5% for the first 10 feet and then will slope at a minimum 1% to existing or new storm drainage. The maximum allowable slope is 2H:1V or flatter if required by the D/B Contractor's Geotechnical Analysis. Turf Reinforcement Matting conforming to Section 815 - Erosion Control of the SCDOT Standard Specifications For Highway Construction shall be used on all slopes steeper than 3H:1V.

A Preferred minimum gradient of 1% shall be used in all parking areas. The maximum gradient used parallel from front to rear of a space shall be 5% and from side to side (width of space) shall be 1.5%.

A soils investigation has been completed for the site and is included as part of this contract in Appendix A. A topographic survey has been completed for the site and is included as part of this contract in Appendix AA.

Particular attention is to be directed toward the Geotechnical Engineering Report (Terracon Project No. 73105046, Dated August 23, 2010) including but not limited to Section 4.0. Coordination between the Geotechnical Engineer of Record and the Structural Engineer of Record concerning foundation support systems and geotechnical remediation of the subsurface conditions is required. Consider continuous mat or a series of isolated mat foundations to mitigate geotechnical differential settlements mentioned in the geotechnical report.

#### 6.4.8. Borrow Material

Properties for borrow material as required for grading, suitable backfill and structural fill should be determined by conducting a Geotechnical Investigation.

Borrow material shall be approved by the COR prior to hauling to the job site for use.

The origin of the borrow material may be as desired by the D/B Contractor and must conform to all permitting and development requirements of the Installation. All required permits and fees will be at the expense of the D/B Contractor.

A soils investigation has been completed for the site and is included as part of this contract in Appendix A. A topographic survey has been completed for the site and is included as part of this contract in Appendix AA.

No borrow material is available on the installation.

#### 6.4.9. Haul Routes and Staging Areas

The construction contractor haul route for the Training Support Center project is through Gate 4 on Boyden Arbor Rd. Turn right on Dixie Rd to Hampton Parkway. Turn left on Hampton Parkway to Lee Rd. Turn right on Lee Rd to Washington Rd. Turn right on Washington Rd to Foster St.

#### 6.4.10. Clearing and Grubbing:

See 5.1 SITE PLANNING AND DESIGN

All materials removed during clearing and grubbing operations shall be disposed of off the Installation at the D/B Contractor's expense.

During clearing and grubbing operations, the D/B Contractor shall protect all trees, shrubs and other vegetation that are to remain.

Should the Installation desire, the D/B Contractor shall stockpile all merchantable timber on site for use by the Installation.

#### 6.4.11. Landscaping:

See 3.2 SITE PLANNING AND DESIGN

The D/B Contractor is responsible for landscaping the project site within the designated construction limits.

Landscaping shall match the overall theme of the Installation. Proposed plantings must be reviewed to ensure that site conditions (soil, topography, adjacent uses, and architecture) and climatic criteria (sun, shade, and moisture requirements) are considered in the desired plant design and selection (i.e., form, texture, color, size). Use a combination of evergreen and deciduous trees to provide windbreak protection from prevailing winds. Landscape planting should be used to supplement dumpster enclosures. Enhance open space areas with planting and use a mix of evergreen, deciduous, and flowering trees.

Landscaping at buildings shall provide a positive sense of arrival. Pavement and proper placement of trees, shrubs, and groundcover are to direct pedestrians to the entrance. The character of the plantings of the adjacent areas is to be considered as well as streetscape plantings. Emphasis should be on primary entrances with secondary entrances treated as scaled down versions of primary.

The plant list and categories are designed to help the designer choose the best plant for each particular set of design requirements. See Appendix I for the Installation's Acceptable Plant List. The Appendix I list supersedes the list that is part of the IDG in Appendix DD. The list in Appendix I is a final list, even though it is marked draft. The use of Crepe Myrtles is encouraged.

Plant groupings and layout shall pay particular attention to site entry, building foundation, building entry, open space and parking lot plantings.

Landscaping features shall be coordinated with all Antiterrorism/Force Protection requirements.

#### 6.4.12. Turf:

The Contractor shall provide a Satisfactory Stand of Turf for all newly graded finished earth surfaces, unless indicated otherwise, and at all areas inside or outside the limits of construction that are disturbed by the Contractor's operations.

Provide sod adjacent to buildings and pavements.

The Contractor shall provide soil preparation, fertilizing, seeding and/or sodding, and surface topdressing.

Seeding shall include both slit seeding and hydroseeding. All areas to be seeded shall be first slit seeded then overseeded with hydroseed, creating two complete layers of seed application.

A Satisfactory Stand of Turf is defined as 95 percent ground cover of the established species.

All seed mixtures/sod materials shall be coordinated through the Installation through the COR.

## 6.5. ARCHITECTURE

6.5.1. General: To the maximum extent possible within the contract cost limitation, the buildings shall conform to the look and feel of the architectural style and shall use the same colors as adjacent facilities as expressed herein. The Government will evaluate the extent to which the proposal is compatible with the architectural theme expressed in the RFP during the contract or task order competition. The first priority in order of importance is that the design provides comparable building mass, size, height, and configuration compared to the architectural theme expressed herein. The second priority is that design is providing compatible exterior skin appearance based upon façade, architectural character (period or style), exterior detailing, matching nearby and installation material/color pallets, as described herein.

### 6.5.2. Design

6.5.2.1. Appendix F is provided "For Information Only", to establish the desired site and architectural themes for the area. Appendix F identifies the desired project look and feel based on Fort Jackson's Installation Architectural Theme from existing and proposed adjacent building forms; i.e. building exterior skin, roof lines, delineation of entrances, proportions of fenestration in relation to elevations, shade and shadow effects, materials, textures, exterior color schemes, and organizational layout.

6.5.2.2. The design should address Fort Jackson's identified preferences. Implement these preferences considering the following:

- (a) Achievable within the Construction Contract Cost Limitation (CCL)
- (b) Meets Milestones within Maximum Performance Duration.
- (c) Achieves Full Scope identified in this Solicitation
- (d) Best Life-Cycle Cost Design
- (e) Meets the Specified Sustainable Design and LEED requirements
- (f) Complies with Energy Conservation Requirements Specified in this RFP.

6.5.2.3. Priority #1. Visual Compatibility: Facility Massing (Size, Height, Spacing, Architectural Theme, etc.) Exterior Aesthetic Considerations: The buildings massing, exterior functional aesthetics, and character shall create a comprehensive and harmonious blend of design features that are sympathetic to the style and context of the Installation. The Installation's intent for this area is:

Fort Jackson does not have specific Design Themes for this facility type. Appendix F is not used. Provide in accordance with the Fort Jackson Installation Design Guide in Appendix DD and in accordance with 6.5.2.6 below.

6.5.2.4. Priority #2. Architectural Compatibility: Exterior Design Elements (Materials, Style, Construction Details, etc.) Roofs, Exterior Skin, and Windows & Door Fenestrations should promote a visually appealing compatibility with the desired character while not sacrificing the integrity and technical competency of building systems.

6.5.2.5. See Appendix F for exterior colors that apply to Architectural character at Fort Jackson. The manufacturers and materials referenced are intended to establish color only, and are not intended to limit manufacturers and material selections.

6.5.2.6. Additional architectural requirements:

(a) Install fall protection anchor points on all roofs with a slope greater than 2:12

b. Exterior Appearance: Due to the height and massing of this facility, the exterior finishes and systems should be treated differently on each building mass. Use variation in material or color to break up the large mass of the warehouse side.

c. Exterior Wall Systems and Finishes: Fort Jackson prefers the appearance of brick masonry building exteriors. Acceptable exterior wall systems include architectural finish concrete masonry units, brick masonry, cast stone trim units and architectural pre-cast concrete panel systems. It is also acceptable to integrate metal panels on portions of the warehouse area. All wall systems shall be insulated. These finishes listed in subparagraph "c" are the only acceptable exterior finishes for this project. This supersedes the preference for metal buildings given in paragraph 3.3.7.1.

d. Where masonry construction is used, wall systems shall include a ventilated airspace with water resistive barrier for drainage plane. Use water insensitive materials in the cavity construction. Where masonry systems are provided, the veneer surface shall be a combination of architectural finish concrete masonry units, architectural finish concrete masonry veneer, face brick veneer and cast stone trim units shall be provided.

e. Architectural Pre-cast concrete wall panel systems are also an acceptable exterior finish. Panels shall be designed to incorporate finishes which add scale and variation to the exterior finish. Acceptable finishes include integral colored concrete, architectural concrete masonry veneer, brick veneer, cast stone, and exposed aggregate. Joint placement and design have an impact on the exterior appearance of the building elevations. Joint placement and design shall be clearly detailed and shown on DB Contractor developed architectural drawings, including building elevations. Where architectural pre-cast panel systems are used, detailing and installation shall utilize techniques to prevent water infiltration at window and door openings. Details that are fully dependent on sealant and gaskets are prohibited. Panels shall be cast with an integral curb, slope or backstop to limit water infiltration.

f. The Installation Design Guide establishes the types, colors and characteristics of exterior finishes for Fort Jackson. Exterior finish material and color selections shall be in accordance with Installation Design Guide. Color and material selections shall be submitted and approved during the design phase.

g. Relationship of Finish Floor elevation to surrounding grade: Finish floor elevation shall be a minimum of 6" above the immediate surrounding grade and the surrounding grade shall slope away from the building a minimum distance of 10 feet. For brick veneer, the relationship of the finish floor elevation and the surrounding grade shall allow the weep to be placed a minimum of one brick course below the finish floor and a minimum of one brick course above the surrounding grade.

h. The finish floor elevation shall be the same throughout the facility. Interior steps and ramps are prohibited.

i. This facility ships and receives products. Provide a covered loading dock as shown on standard floor plan provided in Appendix J. Provide bumper pads and dock levelers at each overhead door. Provide an additional dock plate to be used on any of the berths. Dock shall be approximately 55" in height and accommodate a variety of van and truck delivery vehicles. Actual height to be coordinated with end user during the design phase. Dock shall include egress steps and all appropriate railings. Dock shall include a dock ramp. Air intakes or louvers shall not be located near the loading dock. Provide pavements to accommodate truck access, loading and turning. Provide sloped pavements and storm drainage systems as necessary to prevent standing water at loading dock and surrounding pavement areas.

j. Roof system: Fort Jackson prefers Architectural Standing Seam Metal roofs. However, given the height and span of the warehouse section of the building, low-slope roof systems are acceptable on that portion of the



building. Multi-ply systems are preferred. If single ply systems are provided, select white membranes such as white EPDM, PVC and TPO. Architectural Standing Seam Metal is preferred on the training/admin side of the building.

k. Natural light: Consider strategies to provide natural light throughout the building, such as skylights, roof monitors and insulated translucent panels.

l. Interior column spacing in warehouse: Provide minimum amount of interior columns and coordinate location with function requirements of warehouse. Column placement shall be such that efficient storage, forklift and pedestrian circulation are achieved without interference of columns. Where possible, align columns with walls.

m. Interior Height Clearance: Provide a minimum interior clear height of 24' for the warehouse and production shops, except for the injection molding shop. See paragraph "o" below for hoist clearance requirements. The warehouse clear height shall be able to accommodate 4 tier pallet racks. Clear ceiling height in admin, toilets, break areas, circulation spaces shall be a minimum of 10'. Clear height in training, storage and other spaces on the training/admin side of the building shall be 14'.

n. Building Occupancy: The projected building occupancy is approximately 120 people. This includes 30 each in the training classrooms. Contractor shall calculate occupancy for egress based on code requirements.

o. Monorail hoist: Provide a monorail hoist for the injection molding area. Hoist shall lift be capable of lifting 4000 pounds. Hoist is used to lift molds for injection molding machine and shall be designed and located to fully accommodate that function. Hoist shall be able to traverse area above injection molding machines a minimum of 80' x 20'. The minimum acceptable height for the bottom of the hoist hook is 20' clear.

p. Existing Equipment: Existing, in-use Government property and equipment is to be relocated by the contractor. A list of equipment is provided in Appendix CC. This list is comprehensive, but may not be all inclusive. The existing property and equipment shall be surveyed, catalogued, stored, transported, protected and reinstalled by the Contractor. Equipment design and installation shall include all necessary utilities, connections, vents, drains and structural support. This shall be coordinated by the Contractor with minimal impact to continuous facility operation. Contractor shall engage the services of an experienced industrial designer to provide safe, functional layout of equipment. Shop spaces are shown on the floor plan shall be "right sized" to accommodate actual equipment. Injection molding equipment is especially heavy and each piece shall be installed on a pad with an isolation joint. The Contractor shall have the injection molding equipment calibrated by the equipment manufacturer upon reinstallation. See additional requirements 00 73 10 paragraph 1.7.

q. Building shall be ADA compliant.

r. Sound attenuation: Provide sound attenuation from all mechanical and training spaces to adjoining occupied spaces and corridors. Minimum STC shall be 55 for mechanical and training spaces. Provide sound attenuation for speech privacy in all private offices and conference rooms to all adjoining spaces. This supersedes paragraph 3.3.13.

s. Forklifts: Forklifts are used in the warehouse and production (shop) areas. Several types of forklifts are in use. These include propane, diesel, gas and electric powered vehicles. Provide a battery charging station inside the warehouse to accommodate one forklift. The battery is not removed from the forklift to be charged. Forklift information is provided in Appendix OO.

t. Warehouse rack system: Provide a complete warehouse rack system. This system shall be permanently installed and include integrated fire protection systems. Each rack shall accommodate a pallet load size: 48"x48"x57" high. Pallet loads are not to exceed 1400 lbs. each pallet. Pallet rack system shall be 4 tier high. Rack system shall be provided for warehouse area of building. Provide sufficient quantity of racks to maximize the available area in this space for storage. System shall be laid out to create, safe convenient forklift access to all exterior doors and shops. During the design phase, the contractor' experienced, qualified design professionals shall work with the building user to determine the preferred functional layout of the rack system. Rack system shall include integrated system to protect racks from forklift and material impacts. Provide system as recommended by rack systems manufacturer. Acceptable systems include bollards and integrated steel corner guards. See appendix OO for similar system recently built and in use at Fort Stewart. Appendix OO shows a typical system and is for information only. It is not intended to be a proprietary specification.

- u. Impact resistant interior finishes: Provide impact resistant finishes to 8 feet above the finished floor in all storage and shop areas. For this project, impact resistant finishes are concrete and concrete masonry.
- v. Door Hardware: Provide complete door hardware. All hardware shall comply with ANSI/BHMA A156 standards. All door hardware shall be Grade 1. All items available in stainless steel shall be provided in satin stainless steel, finish 630. Door closer shall be cast aluminum, finish 689. The standard lock system on Fort Jackson is the Best Lock system.

#### 6.5.3. Programmable Electronic Key Card Access Systems:

Provide complete door hardware including all locks and latches. Provide as required by paragraph 3, 5, and Appendices.

#### 6.5.4. INTERIOR DESIGN

- a. Contrary to what is stated in 3.1.5.4 carpet is not considered a betterment. Carpet is required in customer waiting areas, adminareas and conference rooms.
- b. Provide impact resistant finish up to 8 feet above finished floor in warehouse and shop areas to protect the wall system from forklift damage. Acceptable finishes include concrete and concrete masonry.

Interior building signage requirements:

Provide a complete interior signage system. Signage shall be ADA compliant. Signage shall include at a minimum room names, numbers and building directory.

#### 6.6. STRUCTURAL DESIGN

Referencing 5.2.2 - Particular attention is to be directed toward the Geotechnical Engineering Report (Terracon Project No. 73105046, Dated August 23, 2010) including but not limited to Section 4.0. Coordination between the Geotechnical Engineer of Record and the Structural Engineer of Record concerning foundation support systems and geotechnical remediation of the subsurface conditions is required. Consider continuous mat or a series of isolated mat foundations to mitigate geotechnical differential settlements mentioned in the geotechnical report.

Referencing 5.4.2 - Professional Engineering Registration shall conform to all applicable state regulations for Professional Engineering practices in the state in which the project is located in accordance with Federal Acquisition Regulations (FAR) Clause 52-236.25. Design professionals, performing design services and stamping construction documents, shall be licensed in the state of construction.

Referencing 5.4.3 - All submittals shall include complete Structural calculations to support all items, systems, and conditions shown on the drawings and/or referred to in the specifications.

Referencing 5.4.3 - Structural systems requiring Special Inspection or Structural Observation as determined by Chapter 17 the 2009 International Building Code shall be noted on the structural drawings in accordance with (but not limited to) sections 106.3.4, 1603, 1704.1.1 and 1705.

Architect of Record and Structural Engineer of Record are to coordinate the structural systems and interior column locations with the initial review submittal floor plan to minimize column interferences with warehouse storage area, fork truck operating spaces, interior partition walls, and all other interior building features.

Consider load bearing tilt up pre-cast concrete exterior walls with double cantilevered roof framing as a structural superstructure system.

Coordination between the Architect of Record, the Structural Engineer of Record and the Geotechnical Engineer of record concerning the stiffness requirements of the exterior finishes is required. Lateral out-of-plane support for masonry and masonry veneers shall meet the minimum requirements of the International Building Code and all reference standards therein, to include referenced Brick Industry Association standards.

## 6.7. THERMAL PERFORMANCE

All exterior walls and roof shall be insulated. Insulation shall be in accordance with energy performance criteria.

## 6.8. PLUMBING

(a) See section 6.4 regarding water and sanitary sewer.

(b) Cross Connection Control: All local site specific requirements for cross connection control / backflow prevention shall be followed. Domestic water systems shall be protected from contamination from hydronic water systems and other HVAC systems via a reduced pressure zone backflow preventer.

(c) Sewer is treated off-post by the City of Columbia Waste Water Treatment Plant (WWTP). Adequate capacity is to be assumed by the designer.

(d) See paragraph 6.4.6.13 for natural gas utility requirements. PVC shall not used for natural gas piping.

(e) Per the International Plumbing Code, two-way sanitary cleanouts shall be provided 5 feet outside of the building perimeter for all sewer mains exiting any building.

(f) Existing injection molding machines will be moved from the existing facility to the new facility. These machines are currently cooled by chillers which use total-loss condenser cooling supplied by domestic water. Provide cooling towers or other means of cooling for the injection molding machine chillers in the new facility to eliminate this source of water usage. See paragraph 6.11.7 for additional information.

(g) Compressed Air: provide an industrial compressed air system for the facility. System shall consist of compressor(s), storage tanks, filters, refrigerant cooled dryer(s), distribution piping, gauges, valves, regulators,

quick connects, and any related appurtenances. System shall supply compressed air for injection molding machines, tool changers on CNC machine tools, spray painting, portable pneumatic tools, and miscellaneous shop operations.

(h) Particular attention is to be directed toward the Geotechnical Engineering Report (Terracon Project No. 73105046, Dated August 23, 2010) including but not limited to Section 4.0. Coordination between the Geotechnical Engineer of Record, the Mechanical Engineer of Record and the Structural Engineer of Record concerning foundation support systems and geotechnical remediation of the subsurface conditions is required. Movement isolation of ALL utility connections outside of the structure will be required to allow for settlements anticipated on this site.

(i) Domestic hot water shall be produced by a natural gas fired condensing water heater or natural gas fired tankless type. All natural gas fired equipment used on this project shall be capable of burning a liquid propane/air mixture as a backup fuel source.

## 6.9. SITE ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

### 6.9.1 Site Electrical Service:

All electrical systems shall comply with the Fort Jackson Installation Design Guide, IEEE C2 National Electrical Safety Code and the RUS standards. Concrete filled steel bollards shall be provided to protect exposed site electrical equipment. Locate above ground distribution equipment in accordance with UFC 4-010-01 anti-terrorism force protection requirements.

See paragraph 6.4.6 Base Utility Information for additional information on site electrical utility ownership and coordination.

#### 6.9.1.1 Primary Service:

The contractor shall provide underground primary distribution system from point of connection to the base primary distribution system to a new 8320/4800-480/277 delta-wye pad-mounted transformer including primary conductors, primary ductbank, transformer grounding, transformer pad, utility meter, handholes, power poles and pole hardware as required. Provide electric KWH/KW metering including current transformers per Fort Jackson DPW requirements for pad-mounted transformer. See metering paragraph 5.2.5 for metering requirements.

Point of connection is to the main overhead lines circuit BS-1 running along the South side of Washington Road. Contractor shall determine exact point of connection to overhead lines based on final site location of the new facility. Coordinate connection point with DPW.

Existing three phase overhead radial distribution lines run through the middle of the project site that serves several existing facilities that are to remain. The contractor shall relocate these lines along Foster Street and Hall Street as required to maintain electrical power to these facilities. Downtime must be kept to a minimum and no existing facilities left without power due to construction activities.

See base utility maps of existing utilities and topographical map in Appendix AA for location of overhead electrical distribution lines.

Outages on the existing systems shall be scheduled for off peak times (nights and weekends) and shall be approved by DPW. A minimum of 2 weeks advance notification of outage shall be given. Full preparation shall be done before the outage to minimize the downtime duration.

#### 6.9.1.2 Secondary Service:

Provide new secondary ductbank and secondary conductors. Provide 25% spare underground conduits in the ductbank from the secondary of the transformer to the facility. Secondary service shall be direct-burial, thick wall type except concrete encasement shall be provided in areas subject to vehicular traffic. Transitions from below-grade to above-grade shall be galvanized rigid steel. Fittings for steel shall be steel threaded or compression type. The secondary cables shall be of sufficient length to facilitate their connection to the secondary lugs of the transformer. Installation of the cable terminators and connection to the transformer shall be done by the contractor. Provide a 1-inch conduit from utility meter at the transformer to a data collection point located inside the building main telecommunications room.

#### 6.9.2 Site Lighting:

Site exterior lighting for parking areas, roadways and walkways, within the designated construction area, shall be designed and installed by the contractor. Light poles should be placed on a concrete base and height should be such that maintenance can be done using standard equipment. Exterior lighting shall provide a uniform appearance with the surrounding buildings. Comply with Fort Jackson Installation Design Guide.

#### 6.9.3 Site Telecommunications:

Site telecommunications shall be provided in accordance with I3A technical criteria.

See paragraph 6.4.6 Base Utility Information for additional information on site telecommunications utility ownership and coordination.

##### 6.9.3.1 New Telecommunications Outside Plant

(a) Point of connection is in building 2609 via the existing telecommunications manhole and duct system that runs along the North side of Washington Road and connects to bldg. 2609. Nearest existing manhole is MH2500 located at the corner of Marion and Washington streets. Coordinate point of connection with NEC. Building 2609 is located approximately 0.5 miles down Washington Road from the new facility site. See sketch and topographical map in appendix AA.

(b) Provide new telecommunications direct buried schedule 40 PVC ductlines as required from manhole MH2500 into the new main telecommunications room in the facility. Provide two 4-inch conduits with tracer wire. Provide one conduit with three runs of innerduct. Provide pullwire in empty innerducts.

(c) Provide 50 pair voice grade copper cabling for telephone service from the point of connection in building 2609 into the new main telecommunications room in the facility and terminate. Install copper cable in the empty 4-inch conduit.

(d) Provide 12 strand singlemode fiber for data service from the point of connection in building 2609 into the new main telecommunications room in the facility and provide any data cabling/fiber elements required within the facility. Provide service entrance termination hardware. Install fiber cable in one of the innerducts.

##### 6.9.3.2 Existing Overhead Communication Lines:

Existing overhead telecommunications lines run along Hall Street at the edge of the project site that serves several existing facilities that are to remain. The contractor shall relocate or have these overhead communications lines relocated if required. If government owned telecommunications lines the contractor shall be responsible to relocate via coordination with NEC. If cable TV lines the contractor shall be responsible to coordinate with cable company and pay any fees to have the cable TV lines relocated by the cable company. Downtime must be kept to a minimum and no existing facilities left without communications due to construction activities.

#### 6.9.4 Site CATV:

Provide new CATV direct buried 4-inch schedule 40 PVC conduit with pullwire per Time Warner requirements from manhole MH2500 into the new main telecommunications room in the facility. Run along with telecommunications ductlines.

See paragraph 6.4.6 Base Utility Information for additional information on site cable TV (CATV) requirements.

### 6.10. FACILITY ELECTRICAL AND TELECOMMUNICATIONS SYSTEMS

#### 6.10.1 General Interior Power Requirements:

Design and construct the interior electrical distribution system to fully support all facility loads plus 15% spare capacity. The interior electrical distribution system will be 480Y/277 volts, 3-phase 4-wire system and 208Y/120 volts, 3-phase 4-wire system. A main distribution switchboard shall be provided. The switchboard shall be equipped with a distribution section containing molded case circuit breakers and a main section.

All mechanical and lighting loads shall generally utilize 480/277V system. Step down 480 -208/120V transformers shall be provided to support receptacle and other small power loads. Transformers serving non-linear loads shall be rated for a "K" factor of 13. Step down dry-type transformers shall be of a highly efficient design with an energy star rating to ensure low power losses during no and full load conditions. Panel boards serving 208Y/120 volt harmonic loads shall have 200% rated neutral buses. Motors shall not be connected to the same power source as nonlinear loads. The designer shall use the switchboard or additional panel boards to provide power to all mechanical equipment loads.

Provide separate electrical rooms for the installation of switchboard, panelboards, transformers and other electrical equipment, providing required clearances per NFPA 70 requirements. It is the designer's responsibility to determine the size of the electrical rooms based upon design requirements. These electrical rooms shall be dedicated solely for their purpose. No HVAC ducts or plumbing shall be routed through the dedicated electrical space or over electrical equipment. Environmental control shall be provided as needed to meet the equipment environmental requirements.

The electrical design shall be such that accessibility to equipment for maintenance and repair and for any possible extensions, modifications, or alterations to the systems is provided in accordance with the recommendations of the equipment manufacturer and the National Electrical Code.

#### 6.10.1.1 Grounding System:

A transformer and building grounding system shall be provided. The grounding system shall consist of ground rods and a ground ring encircling the building. The communications and electrical rooms ground shall be bonded to the building ground at the main panel board. Provide ground bus system in each electrical room. Separate grounding electrode systems shall be provided for power, lightning protection, signal, etc. Provide a ground bar encircling the communications rooms. Ground bar shall be bonded to the main electrical ground. Grounding electrode systems shall have a maximum resistance to ground of 25 ohms or less and shall be interconnected at a single point. Grounding systems for facilities containing computers or other surge-sensitive electronic equipment shall be designed to achieve a maximum resistance to ground of 5 ohms or less. Equipment stipulated to have a single-point ground shall have a green conductor connected to a single point in the facility grounding system.

#### 6.10.1.2 Power Quality Systems:

The facility shall be protected with a Transient Voltage Surge Suppression (TVSS) system. The service shall be provided with TVSS protection and supplemental or cascaded protection throughout the facility at critical load panels and major separately derived system distribution equipment. Each distribution panel board shall be provided with integral TVSS. TVSS shall be provided where exterior power, security, control and telecommunication system cables enter the facility. Power factor (PF) correction capacitors shall be provided on all single motors of 20 HP or

greater utilizing magnetic controllers to correct the inductive circuit to 95% PF when in use. Isolation drive transformers shall be supplied with large VFDs to isolate or correct the harmonics created by silicon controlled rectifiers (SCRs) or insulated gated bipolar transistors (IGBTs).

6.10.1.3 Provide branch circuits, disconnect switches, magnetic starters, and all other related electrical equipment and material for all architectural, mechanical equipment, shop equipment and environmental equipment to be installed in the project (includes the facility and site). Contractor shall coordinate this electrical requirement with the architectural, shop equipment and mechanical requirements.

(a) Provide and coordinate all electrical power requirements for relocated shop equipment. See appendix CC for a list of existing shop equipment to be relocated by the contractor from the existing Training Aids Support Center building 12650 to the new Training Support Center facility. List of equipment in appendix CC is for informational purposes only and may not be all inclusive or completely accurate for final design purposes. The contractor is responsible for performing extensive field investigations to determine the exact quantity, equipment type and power requirements for existing shop equipment to be relocated. When relocated shop equipment has multiple voltage ratings the equipment should be connected to the highest voltage allowed where feasible. Equipment may not currently be connected to the highest voltage allowed by the equipment. The contractor shall be responsible for rewiring, retapping, moving toggle switches, etc. as required to connect to highest voltage.

(b) Provide wiring for automated plumbing fixtures where required by architectural design.

(c) Provide connection to base Utility Monitoring and Control System (UMCS). This is to include the HVAC DDC Control System and the utility meters. The DDC system and meters communicates to the Base front end stations via radio (wireless transceiver) operating in the 2.4 GHz bands, commonly referred to as IEEE 802.11b/g.

(d) Provide a battery charging station inside the warehouse to accommodate one electric forklift. The battery is not removed from the forklift to be charged.

#### 6.10.1.4 General Purpose Receptacles:

Receptacles shall be provided in accordance with NFPA 70. Duplex receptacles for general-purpose applications shall be 20 amp, 125 volt grounding type. A maximum of six duplex receptacles may be connected to a receptacle circuit. All circuits serving receptacle outlets shall be provided with a dedicated neutral conductor. Receptacle circuits shall not supply lighting loads. Lighting and receptacle outlets shall be on separate branch circuits. Power receptacles that supply power to electrical appliances, portable equipment or tools and extension cords or cable shall have grounding pole. Receptacles shall have grounding pole incorporated into the body of each receptacle along with other poles required to supply power to connected items of equipment. Receptacles shall be standard NEMA type unless others are required for specialized applications.

(a) Provide a duplex receptacle for each electric water cooler.

(b) Provide dedicated duplex receptacles for the government furnished and government installed copier and fax machines.

(c) Provide and coordinate electrical circuits dedicated to provide power for telecommunications equipment. A NEMA 5-20R duplex receptacle within 6" of every telephone outlet shall be provided.

6.10.1.5 Wherever empty conduits are provided, drawings shall note to be labeled with source and destination at both ends and at each pull box. Empty conduits shall require a nylon pull rope provided with 10 additional feet of pull rope coiled at each end.

### 6.10.2 Lighting:

All light fixtures, exit signs, egress light fixtures, etc., shall be of the heavy commercial grade.

6.10.2.1 Location of light switches shall be coordinated with the floor plan and furniture layout to ensure that they are easily accessible and convenient. Location shall be coordinated with the User. All entry points into a room will require switch control for the lighting. Provide 3 and 4 way switching for rooms that have multiple entry points.

6.10.2.2 The electrical sustainable design features (LEED certification) targeted for this project include light pollution reduction and energy efficient lighting and controls. Occupancy sensors and daylight dimming techniques shall be utilized wherever feasible as an energy conservation means to reduce overall electrical energy consumption. Sensors are to be infrared type where possible. Provide daylight dimming controls in the warehouse and shop areas where rooftop daylighting monitor panels are installed.

6.10.2.3 Provide lighting for maintenance purposes for all areas in which mechanical equipment is located including the outdoor mechanical and electrical equipment areas.

6.10.2.4 Fluorescent fixtures used in Telecommunication Room shall use ballasts that have appropriate filtering to reduce RFI and EMI emission so as not to interfere with electronic equipment.

6.10.2.5 Emergency and exit lights shall be provided throughout the facility to obtain the required foot-candle levels as outlined in the NFPA and IES standards for emergency egress illumination. Exit fixtures shall be of the LED type. The LED color shall be red with battery backup.

### 6.10.3 IDS:

The contractor shall provide a zoned intrusion detection system (IDS) with battery backup to monitor all entry points to the facility including all exterior personnel doors and roll up doors. The IDS shall also separately monitor the Secure Operations Storage room entry points. IDS shall consist of conduit, cabling, outlet boxes, balanced magnetic switches and motion sensors per specified user locations in the vicinity of the doors. Conduits shall be run to a j-box located above ceiling in an accessible location for ease of cable pulling.

Provide key pad control pads at three different locations. Coordinate locations of keypads and zone requirements with the end user and Ft. Jackson Physical Security.

The IDS shall be ICIDS-III compatible. Installation of the IDS shall be under the supervision of Ft. Jackson Physical Security. The new IDS shall be installed and tested by a technician certified by the IDS manufacturer. Point of contact for Ft. Jackson Physical Security IDS requirements is David Little (803) 751-7076.

In addition, the Contractor shall provide a dedicated communication line from the telecommunication room to the IDS control panel for connection by others to tie into the monitor point at the MP station located at Building 5499. The Contractor shall provide a dedicated power 30A branch circuit to the IDS control panel.

Contrary to what is stated in 3.1.5.3, CCTV is not considered a betterment. Closed-circuit television system is not required.

### 6.10.4 Telecommunications:

Contractor shall coordinate all communications requirements with the User, and the Fort Jackson Network Enterprise Center (NEC). Design shall conform to the requirements noted herein. The scope of work covered under this statement of work shall consist of the contractor furnishing all necessary engineering, labor, material, equipment, and testing to provide voice and data communication for support of information systems of the facility. The contractor shall be responsible for installation of all cable and connection hardware. Telecommunication



designer shall be a Registered Communications Distribution Designer (RCDD). The contractor will provide cabling and conduit from the nearest manhole into the building Tele-communication Entrance Facility and terminate in accordance with I3A Technical Criteria and EIA/TIA 569 Standard.

Contractor shall provide a complete structured cabling and pathway interior distribution for CATV, voice, and LAN systems. Cabling includes cable and the fittings, connectors, terminal strips, patch panels and similar devices needed to install cable. Pathways include conduit, tubing, junction, outlet boxes, raceway, Network equipment racks and/or lockable Network equipment cabinets, ductwork, and riser system associated with the distribution of telecommunications and information systems. These systems will be made ready for the installation of Government Furnished and Government Installed (GFGI) equipment. All fiber optic connectors shall be ST type connectors. Provide separate patch panels for voice and data.

Public address system is not required.

Telecommunications Systems labeling shall be provided in accordance with EIA/TIA 606.

The Telecommunications Room shall be sized in accordance with EIA/TIA 569 Commercial Building standard to provide the necessary space for all the telecommunications equipment. Carpet should not be installed in closets. Provide tile or sealed concrete floors that will protect equipment from static electricity and dust. This room will be temperature controlled for equipment cooling purposes. It will also have a locked access door with the standard Ft. Jackson communications lockset installed-key # GMF 3.

The major components of the building electrical system shall not be co-located in the telecommunications room. Closet space should be dedicated to serving telecommunication needs only. Electrical installations supporting telecommunication functions only should be located in the closet.

Provide communications channel ladder in Telecommunications Room to provide means to route cabling to racks and wall mounted termination facilities.

#### 6.11. HEATING, VENTILATING, AND AIR CONDITIONING

6.11.1 Commissioning Coordination Conference: Hold a commissioning coordination conference within 45 days of acceptance of 100% design package. This conference shall include the commissioning agent (CxA), Fort Jackson Resident Engineer and appropriate staff, and other personnel as appropriate. The purpose of this conference is to allow the Resident Engineer and staff to clearly communicate commissioning requirements and expectations to the contractor and commissioning agent and avoid issues which have occurred on previous projects.

6.11.2 Requirements for Commissioning Agent (CxA) at the Performance Verification Test (PVT) of paragraph 5.8.3.11: CxA shall be present during the PVT and shall assist the Government in the supervision of the PVT.

6.11.3 The Building Automation System (covered in paragraph 5.8.3) shall also meet the requirements of UFGS 23 09 23, "Lonworks Direct Digital Control for HVAC and Other Building Control Systems".

6.11.4. The building UMCS shall communicate with the base UMCS via radio (wireless transceiver) operating in the 2.4 GHz bands, commonly referred to as IEEE 802.11b/g. The radio is used to provide a network connection. Building systems shall be fully integrated with existing base UMCS including provision of complete front-end graphics. The existing base UMCS is Honeywell EBI. Contrary to what is stated in paragraph 3.5.1.5.2, provision of connection to the UMCS is not considered a betterment for this project. The point of contact for the UMCS is Mr. Dan Silvey, e-mail: danny.silvey@us.army.mil

#### 6.11.5 Industrial Ventilation Requirements

6.11.5.1. Provide an exhaust system for woodworking operations per NFPA 664. A 55 gallon drum shall be provided to collect residue from the dust collector. Collectors shall be provided for all stationary woodworking equipment per the recommendations of "Industrial Ventilation- A Manual of Recommended Practice for Design, 26th Edition". In addition, provide floor sweeps throughout the woodworking shop to allow collection of debris from the floor. A list of existing woodworking equipment and other shop machinery to be transferred from the existing facility to the new facility is included as an attachment to this RFP. Confirm the actual equipment to be moved and used in the new facility prior to designing exhaust system.

6.11.5.2 Provide exhaust ventilation in the print shop area to remove fumes from glue (spray contact cement) used for preparation of posters and similar items.

6.11.5.3 Provide exhaust and supply ventilation in the Pour Room, which is used for making castings from two-part urethane foam.

6.11.5.4 Provide general and local exhaust ventilation systems in welding shop for exhausting welding fumes. Welding operations chiefly use the Metal Inert Gas (MIG) and Tungsten Inert Gas (TIG) processes.

6.11.5.5 Provide supply ventilation for the Paint Shop to support the paint booth. The existing paint booth is an open-front unit approximately 10 feet wide x 8 feet high x 6 feet deep and will be moved from the existing facility to the new facility. The existing vaneaxial paint booth exhaust fan shall be moved with the paint booth. Provide all necessary ductwork, transitions, etc. to provide a fully functional system in the new facility. Exhaust from this paint booth is covered under an existing air permit. Coordinate with the Environmental Management Division (EMD) staff during the design phase. See paragraph 6.16 for detailed requirements.

#### 6.11.6 HVAC Systems

6.11.6.1 Cooling for the facility shall be provided via chilled water supplied from Central Energy Plant (CEP) 3, building 1699, which is located approximately 1500 feet east of the site. Provide new tertiary chilled water pumps for this facility in the mechanical room. See paragraph 6.4.6.8 for additional information.

6.11.6.2 Heating for the facility shall be provided by hot water supplied by local condensing natural gas fired boiler(s). All natural gas fired equipment used on this project shall be capable of burning a liquid propane/air mixture as a backup fuel source.

6.11.6.3 Telecommunications Rooms: Telecommunication equipment rooms shall be air conditioned to space comfort conditions per EIA/TIA 569A by dedicated, separate, direct expansion system(s) that can be operated year-round.

6.11.6.4 Hydronic Systems: For balancing HVAC hydronic systems, use only calibrated balancing valves. Do not use triple duty or auto flow valves.

6.11.7 Industrial Equipment Cooling Systems- The shop area of the Training Support Center includes three injection molding machines that are cooled with chilled water. Three portable water-cooled chillers are provided in the existing facility to provide cooling water to the injection molding machines. Data on the existing chillers is provided in Appendix CC; these chillers shall be moved to the new facility along with the injection molding machines.

The existing configuration of the portable chillers relies on "total loss" cooling for the condensers using potable water. In the new facility, provide cooling tower(s) for these chillers to eliminate this waste of water.

Provide power connections, condensing water connections, chilled water connections, and all other utilities required for the operation of these chillers in the new facility.

In addition to the chillers which will be moved from the existing facility, provide piping, connections, and valves to connect the building chilled water system to the injection molding machines. This is required in order to provide a back-up source of cooling for the injection molding machines. Design and construct chilled water systems in the new Training Support Center so that chilled water can be provided to the injection molding machines from either the portable chillers or from the building chilled water system (which is supplied from CEP 3).

Integrate the control system to the installation's existing UMCS. The existing UMCS is Lonworks. Front end is Honeywell EBI

## 6.12. ENERGY CONSERVATION

### 6.12.1. General

Provide in accordance with paragraphs 5.9 and 5.11.

6.12.2. Inclusion of Renewable Energy Features. The following renewable energy features have been determined lifecycle cost effective, are included in the project budget and shall be provided:

Provide in accordance with paragraphs 5.9 and 5.11.

## 6.13. FIRE PROTECTION

### 6.13.1 Fire Protection Site Design

(a) See paragraph 6.4.6.11 for fire hydrant requirements.

(b) Fire department access for roads/gates shall have an unobstructed width of not less than 20 ft. and 13 ft. 6 in. for vertical clearance in accordance with NFPA 1. ATFP gates must open at least 20 feet wide.

### 6.13.2 Fire Alarm Control Panel / Devices / Miscellaneous

Provide a new addressable Edwards Systems Technology or equal fire alarm system as prescribed by the most current version of UFC 3-600-01, NFPA 101 and installed in accordance with NFPA 72 to include a Mass Notification System per UFC 4-021-01- Mass Notification Systems. The Authority Having Jurisdiction (AHJ) requires the following to meet the local requirements for installation of fire alarm systems:

#### (a) Mass Notification:

Mass notification system (MNS) shall be compatible and integrated into the Installation's existing Giant Voice system. Existing Giant Voice is a radio system consisting of both Wheelock and ATI components. New system shall be trunking capable. The MNS shall be equipped with Local Operating Consoles (LOC) and shall be design in accordance with the latest version of UFC 4-021-01. Provide a Local Operator Console in the administration area. Locations shall be finalized during the design phase.

#### (b) Fire Alarm System:

Existing local receiving system is the Monaco BT-X with narrow band technology. Provide an addressable Fire Alarm Control Panel (FACP). The fire alarm system shall meet Fort Jackson's 911 Center configuration requirements for interconnection to the fire alarm receiver. This fire alarm system shall consist of a fire alarm panel, a RF transceiver, initiating devices, notification devices, wiring and conduit system. Equipment supplied shall be fully compatible with the central facility equipment. Class A addressable system shall be installed. Provide hard-wired, visual- indicating line voltage surge arrestors on each branch circuit feeding each separate panel and low voltage surge devices on circuits that enter and exit the building envelope and lightning surge arrestors for exterior antenna circuit. Provide smoke detector on ceiling over FACP. Provide ductwork smoke detectors, self resetting type and for use in high humidity. Provide labels adjacent to each detector for easy location. Each detector shall have an accessible remote test switch with LED indicator. Pull stations shall be single-action, non-glass rod type. Provide pull station covers to all pull stations to reduce accidental alarms, as determined by the AHJ. No audible horn is required on the pull station covers. Provide tamper switches on all fire water supply control valves, including the back flow prevention device. Provide 10% replacement initiating devices for the alarm system. The Contractor shall specify maintenance accessibility for initiating devices to include duct detectors that is acceptable to the local fire alarm technician. Provide fire alarm remote annunciator as determined by the AHJ. Provide manufacturer colored conduit, connectors and boxes for all emergency circuits. Color shall be solid red, unless determined by the AHJ. The FACP shall be located in a conditioned space with direct access to the outside, as determined by the AHJ. All devices shall be labeled by FACP address. Mount FACP panel and Monaco BT-X side by side with the top of the enclosures no higher than 5'-8". Lockable circuit breakers shall be provided for the FACP and transmitter. Locking devices shall be red. Fire alarm zoning must also be done in accordance with local AHJ guidance and coordinated with the Fire Marshal. Provide training to Fort Jackson fire department personnel and to the local fire alarm technician on the FACP. Training shall be conducted at Fort Jackson.

(c) The fire alarm system shall be designed by a professional Fire Protection Engineer. The installation of the fire alarm system shall be managed by a NICET Level III fire alarm system qualified technician. The technician shall be factory trained and certified for fire alarm system installation and emergency communications system installation of the specific type and brand of system and who are acceptable to the AHJ. Technician shall comply with the requirements of UFC 3-600-01.

(d) Coordinate with Fort Jackson's Directorate of Emergency Services for specific Fire Alarm System Installation requirements. POC Information: Assistant Chief Scott Dollman (803) 751-1614 [HYPERLINK "mailto:scott.dollman@us.army.mil"](mailto:scott.dollman@us.army.mil), Inspector Peter Hines (803) 751-1611 [HYPERLINK "mailto:peter.hines@us.army.mil"](mailto:peter.hines@us.army.mil), Inspector Jamal Black (803) 751-

5239 HYPERLINK "mailto:jamal.black@us.army.mil"jamal.black@us.army.mil, or Inspector Gino Sita (803) 751-1610 HYPERLINK "mailto:aniello.sita@us.army.mil"aniello.sita@us.army.mil.

(e) Provide necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, equipment specific interfacing cable and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without subsequent or future dependence on the Contractor.

(f) Provide a full sized set of the fire alarm system 'as-built plans' directly to the local fire alarm technician. Provide full sized set and electronic versions (PDF and ADD of the fire alarm system 'as-built plans' to the Fort Jackson DPW, CADD manager Carl Davenport, 803-751-0882.

(g) The RF transceiver shall be compatible with the fire department's receiving system, operating on a RF frequency and shall be coordinated with the fire department POC.

(h) Provide Knox Box with tamper switch that is monitored by the FACP. Ordering information and forms are available from the Fort Jackson Fire Department.

#### 6.13.3 Fire Extinguishers

Fire extinguishers are GFGI. Provide recessed cabinets to accommodate GFGI extinguishers. Cabinets will not require breaking glass to access the fire extinguishers.

#### 6.13.4 Fire Suppression Systems

(a) Provide a complete automatic sprinkler system in accordance with NFPA 13, NFPA 101, and UFC 3-600-01.

(b) Provide wet/dry standpipe for this facility in accordance with UFC 3-600-01 and NFPA 14. Depending on size and layout of this facility standpipe connections may be required in several locations. See below: UFC 3-600-01 4-5.1 Class I standpipe systems must also be provided in facilities where it is not practical to reach major portions of the building with fire fighting hose lines extended from the exterior of the building, regardless of building height.

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6.13.5 OS&Y Valves- Any valve on fire protection water back flow preventer which can act as a control valve shall be secured and monitored via the fire alarm panel so that the Fire Department is notified if the water supply to the building is secured.

#### 6.14. SUSTAINABLE DESIGN

6.14.1. LEED Rating Tool Version. This project shall be executed using LEED-NC Version 3.

6.14.2. The minimum requirement for this project is to achieve LEED Silver level. Each non-exempt facility (building plus sitework) must achieve this level. In addition to any facilities indicated as exempt in paragraph 3, the following facilities are exempt from the minimum LEED achievement requirement: The Hazardous Materials Covered Storage area is exempt..

6.14.3. Credit Validation: LEED registration, compiling of documentation at LEED OnLine and use of the LEED Letter Templates is required. Registration and payment of registration fees will be by the Contractor. Administration/team management of the online project will be by the Contractor. Validation of credits will be accomplished by the Government. LEED certification of the project by the Contractor is required. The Contractor

will obtain LEED certification prior to project closeout. Application, payment of certification of fees and all coordination with USGBC during the certification process will be by the Contractor. GBCI interim review of design phase data is not required by the Government but is recommended. Government validation during project execution does not relieve or modify in any way the Contractor's responsibility to satisfy all requirements for certification as defined by LEED and GBCI. Contractor is not responsible for design phase LEED documentation of any unaltered portion of the design that is accomplished by others. If the project includes unaltered complete design by others, during the certification process Contractor will coordinate all GBCI comments on LEED credits that fall outside Contractor's scope of responsibility with the Government for coordination with the Designer of Record, and Contractor will not be penalized if project fails to achieve certification at the minimum required level due to loss of credits that are the responsibility of others.

6.14.4. Commissioning: See Appendix M for Owner's Project Requirements document(s).

6.14.5. LEED Credits Coordination. The following information is provided relative to Sustainable Sites and other credits.

**SS Credit 1 Site Selection:**

Project site IS NOT considered prime farmland.

Project site is five feet or more above 100-year flood elevation.

Project site contains no habitat for threatened or endangered species.

No portion of project site lies within 100 feet of any water, wetlands or areas of special concern.

Project site WAS NOT previously used as public parkland.

**SS Credit 2 Development Density & Community Connectivity.**

Project site DOES NOT meets the criteria for this credit.

**SS Credit 3 Brownfield Redevelopment.**

Project site DOES NOT meets the criteria for this credit.

**SS Credit 4.1 Public Transportation Access.**

Project site DOES NOT meets the criteria for this credit.

**EA Credit 6 Green Power.**

35% of the project's electricity WILL NOT will be provided through an Installation renewable energy contract. Do not purchase Renewable Energy Credits (REC's) to earn this credit.

**MR Credit 2 Construction Waste Management.**

The Installation does not have an on-post recycling facility available for Contractor's use.

**Regional Priority Credits (Version 3 only)**

The project zip code is 29207.

6.14.6. LEED Credit Preferences, Guidance and Resources. See Appendix L LEED Project Credit Guidance for supplemental information relating to individual credits.

6.14.7. Not Used

6.14.8. Additional Information

Not used.

## 6.15. ENVIRONMENTAL

### 6.15.1 Environmental Protection Plan Submittals

The Contractor shall include Fort Jackson DPW in the submittal distribution of the Environmental Protection Plan.

### 6.15.2 Waste Diversion Plan

Fort Jackson requires a minimum of 50% diversion of construction waste to recycling. Provide waste diversion plans to the COR and submittal documentation in the form of manifests of actual disposal to document construction waste disposal and recycling. Provide an additional copy of the waste diversion plan and manifests to DPW for their use. This submittal information, including the waste diversion plan and disposal documentation shall be routed through the COR, but clearly marked to be forwarded to DPW.

### 6.15.2 Previous Use of Site

The project site was used as a fueling facility until 1984.

Underground fuel tanks were removed sometime between 1984 and when environmental assessment began in 1992. Records of removal indicate that the tanks were excavated and removed, the excavated opening was lined with plastic sheeting and the excavated soil was returned to the hole. Records address the tank only and are not clear on whether all associated piping and anchorage (concrete slab below tank) were removed at the time of tank removal. In other similar locations on Fort Jackson, the associated anchorage was not removed. Accurate records of exactly what existed on the site are not available. It is known that there were 15 underground storage tanks removed (12 x 12,000 gallon-capacity USTs + 1 x 10,000 gallon-capacity UST + 2 x 5,000 gallon-capacity USTs). Gasoline, diesel, fuel oil and solvent were stored in these tanks, but more specific records are not available.

The site was monitored until 2009 at which time SCDHEC concurred with Fort Jackson recommendations for no further action (NFA). Therefore, the site does not require any further remediation and is suitable for any use.

Monitoring wells (2" diameter) were installed as part of this process.

These wells are now officially abandoned and have been grouted in from the bottom up to the top of the casing/ground surface. The casings may still be in place and grouted, or the casing may have been pulled and the remaining borehole grouted. Records indicate there are 21 abandoned wells on the site. Map locations and wells depths are included in Appendices EE, FF and GG. Please note: these wells were not found during the topographic survey and their locations are not shown on the topographic survey. The maps provided are the only documentation of the location of these abandoned monitoring wells. DPW Environmental will flag the well locations. The Contractor shall notify DPW Environmental to request flagging of well locations. The contractor shall allow one week for DPW to locate wells.

For all abandoned monitoring wells within the project site, the contractor shall locate, hand excavate, stabilize against horizontal movement and carefully shear the grout column. Depth of hand excavation and shearing shall be 1 foot below the excavation depth required for construction activities in immediate vicinity of each abandoned well.

Contractors shall provide stabilization of the casing and/or grout column during both excavation and shearing as needed to arrest horizontal movement of the casing/column. It is important that the casing/column remain securely compacted in the surrounding soil during this process so that vertical voids are not created surrounding the casing/column that will allow vertical movement of ground water. Once shearing is complete and excavation is backfilled, uniform settlement of the compacted area is acceptable.

The contractor is not required to excavate or remove any piping, anchorage or foundation material associated with the former fueling facility that is not impacted by the construction of the new facility, site improvements, site amenities or utilities. Removal of the former fueling facility for site remediation purposes is not required. Any remaining piping, anchorage or foundation material within the excavated construction area of building, site

improvements, site amenities or utilities of shall be removed and the remaining void shall be filled and compacted in accordance with standard site preparation practices.

The plastic sheeting placed at the time of tank removal is no longer necessary. If it is encountered during excavation or construction activities, it is not required to be protected or maintained.

See Geotechnical report in Appendix A. Extensive site work may be required. All site preparation and site work activities shall be coordinated. If existing soil in the vicinity of an abandoned well is removed from the site to a depth greater than the bottom of an abandoned well, it is acceptable to completely remove the abandoned well. Soil removed from the site does not require special handling or disposal procedures. Deep foundations are acceptable and do not require any special procedures relating to the previous soil contamination.

If during the course of work, the Contractor encounters any visual or olfactory contamination, the Contractor shall immediately contact DPW Environmental POC Lahiri Estaba at 803-751-7332. Any encountered contamination shall be properly handled and disposed of at the direction of DPW Environmental. This would include, but may not be limited to, screening, segregating and properly disposing of the materials.

Old Aerial photos of the site are provided in Appendix NN. These provide an indication of previous uses and structures no longer visible on the site.

## 6.16. PERMITS

6.16.1 General. Obtaining permits shall be the responsibility of the Contractor. The Contractor shall be responsible for obtaining all applicable permits (local, state, and federal) as part of the design process and shall secure all permits necessary for construction of this project within the designated building area limits. The Government will not obtain any permits for this project. All permit preparers must be registered/qualified in the state of South Carolina. The Contractor is required to pay all permitting fees associated with this project, at no additional expense to the Government. The Contractor shall prepare all permits, providing all required information and supporting documentation in a form ready for signature by the Owner and submittal to the applicable agency. Should the permitting agency require additional clarification or information during the permit review process, the Contractor shall provide all necessary assistance to resolve the outstanding issue. The Contractor is responsible for complying with all local, State and Federal regulatory requirements.

### 6.16.2 Air Permits.

The Contractor shall be responsible for coordinating with Fort Jackson's Environmental Management Division (EMD) staff in obtaining all required and applicable permits as part of the design process and shall secure all permits necessary for construction of this project. Fort Jackson operates under a Title V Air Permit for air quality requirements, and the contractor is required to perform a regulatory review of all air sources in the project and submit for approval to the EMD. Each Congressional Appropriation is defined as one project. Additionally, new sources must be reviewed for NESHAP (National Emissions Standards for Hazardous Air Pollutants) applicability. Contractor is required to develop required air permit application(s) and/or coordinate with EMD on any on-going permit applications. Contractor is responsible for all air permitting fees and all required permits shall be obtained prior to construction of any new sources. Contractor is responsible for complying with all State regulatory requirements for boilers fired by either natural gas or distillate oil, and insuring that the boiler(s) is included in the Installation's Title V Air Permit. New boilers with an input greater than 10 million btu/hr shall meet 40 CFR Part 60, New Source Performance Standards. All new boilers shall include low NOx burners. The Contractor is required to have an air permit for each type of material (i.e. concrete, rock crushing, asphalt batch plants) that will produce dust and other harmful particulates within the boundaries of the installation. The Installation's Title V Air Permit cannot be changed unilaterally by the Contractor, and the Contractor shall coordinate any and all changes/modifications through the designated EMD staff.

6.16.2.1 Paint Booth: This facility has an existing, permitted paint booth. The paint booth will be relocated to the new facility. Coordinate with DPW Environmental for paint booth air permits. The DPW Environmental POC for Air Permits is Christy Pollack. Permits are required for construction and operation. The contractor should allow 180 days for permit processing.



#### 6.16.2.2 Air Permit Submittal Requirements (Boilers and Domestic Water Heaters).

Pursuant to satisfying requirements under the Clean Air Act, at or before the 60 percent design stage, the D/B Contractor shall submit the following to the installation's environmental office:

- (1) A listing of boilers and domestic hot water heaters that will be fired by natural gas, propane, and/or fuel oil
- (2) The fuel or fuels (primary and backup, if applicable) that will be utilized for each piece of equipment
- (3) The quantity of each particular size
- (4) The respective input firing rate. The document shall also provide a point of contact and an alternate point of contact, should the environmental office require additional information from the designer of record during the permitting process. Furthermore, two copies of the document shall also be sent to the Savannah District, one to the Project Manager for placement in Central Files, and another to the Mechanical Section.
- (5) This document shall not be sent prematurely, since any increase in boiler sizing subsequent to submission of the document will require revision to the permitting process. In any event, if there is a change in equipment sizing during refinement of the design process, an updated copy of said document shall be submitted per the guidance above.
- (6) Additionally, the D/B Contractor is responsible for incorporating into the design the equipment accessories required for compliance with the governing environmental laws. This includes, but is not limited to, determining the need for individual metering and the level of emissions monitoring required. The D/B Contractor's concept design narrative shall specifically address those features that will be incorporated into the boiler system design to assure compliance with the applicable environmental laws of the State.
- (7) Prior to the submission of form DD 1354 Acceptance of Real Property, the Contractor shall submit to EMD copies of all required Federal and/or State certifications associated with emission units, i.e. visible emissions certifications. The dates that the certifications are turned into EMD shall be noted in the remarks section of form DD 1354.  
Proposers shall be aware that, normally, for fast track design-build contracts, the construction permit will not have been obtained prior to award of the design-build contract. No construction associated with the building(s) housing the boiler(s) or other source(s) of contaminant can be done prior to obtaining the required permit. Generally, only the following things can be done prior to possession of the permit: clearing and grading, access roads, driveways, parking lots, underground utilities up to the 5- foot line of the buildings, and ancillary structures (structures not associated with housing the sources of contaminants).

#### 6.16.3 Notice of Intent (NOI) Requirements.

The NOI for Stormwater Runoff from Construction Activities, and all fees required, shall be filed by the Contractor prior to construction start.

#### 6.16.4 Dust Permit.

Contractor is required to prepare and follow a Fugitive Dust Control Plan (FDCP). The FDCP shall include dust suppression techniques, such as wetting exposed soil, to prevent the generation of dust.

#### 6.16.5 Soil Erosion.

The CONTRACTOR shall be responsible for obtaining all permits (local, state and federal) required for design and construction of all site features and utilities.

#### 6.16.6 An Installation digging permit is required.

#### 6.16.7 NPDES Construction Permit is required.

#### 6.16.8 No diesel generators are permitted.

#### 6.17. DEMOLITION

See the attached geotechnical report and site topography for demolition requirements and a discussion of existing site conditions. All demolition work shall be coordinated with Fort Jackson DPW prior to commencement of construction activities.

#### 6.18. ADDITIONAL FACILITIES

##### Hazardous Materials Storage Area:

Provide 5 individual 144 SF (12'x12') exterior covered storage areas for hazardous materials storage, including concrete slab floor and containment curb. Enclosure shall be secure and wall ventilated. Exterior finishes shall match the building exterior. Separate these areas from the building and from each other as required by code. Individual areas shall be designed and installed to contain each of the following materials: (1) propane storage area; (1) acetylene; (1) oxygen; (1) satellite hazard accumulation; (1) empty drums

Storage areas require vehicle access.

End of Section 01 10 00.0001

**SECTION 01 32 01.00 10  
PROJECT SCHEDULE**

**1.0 GENERAL**

1.1. REFERENCES

1.2. QUALIFICATION

**2.0 PRODUCTS (NOT APPLICABLE)**

**3.0 EXECUTION**

3.1. GENERAL REQUIREMENTS

3.2. BASIS FOR PAYMENT AND COST LOADING

3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

3.4. PROJECT SCHEDULE SUBMISSIONS

3.5. SUBMISSION REQUIREMENTS

3.6. PERIODIC SCHEDULE UPDATE MEETINGS

3.7. REQUESTS FOR TIME EXTENSIONS

3.8. DIRECTED CHANGES

3.9. WEEKLY PROGRESS MEETINGS

3.10. OWNERSHIP OF FLOAT

3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

## **1.0 GENERAL**

### **1.1. REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- U.S. ARMY CORPS OF ENGINEERS (USACE) ER 1-1-11 (1995) Progress, Schedules, and Network Analysis Systems <http://www.usace.army.mil/publications/eng-regs/er1-1-11/entire.pdf>

### **1.2. QUALIFICATIONS**

Designate an authorized representative who shall be responsible for the preparation of the schedule and all required updating (statusing) and preparation of reports. The authorized representative shall be experienced in scheduling projects similar in nature to this project and shall be experienced in the use of the scheduling software that meets the requirements of this specification.

## **2.0 PRODUCTS (Not Applicable)**

## **3.0 EXECUTION**

### **3.1. GENERAL REQUIREMENTS**

3.1.1. Submit a project schedule as specified herein for approval showing the sequence in which the Contractor proposes to perform the work and dates on which the Contractor contemplates starting and completing all schedule activities. The scheduling of the entire project, including the design and construction sequences is required. Contractor management personnel shall actively participate in its development. Designers, subcontractors and suppliers working on the project shall also contribute in developing an accurate project schedule. The schedule must be a forward planning as well as a project monitoring tool. The approved project schedule shall be used to measure the progress of the work and to aid in evaluating requests for excusable time extensions. The schedule shall be cost loaded and activity coded as specified herein. The schedule will provide the basis for all progress payments. If the Contractor fails to submit any schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule

3.1.2. Status the schedule on at least a monthly basis, as specified herein. If in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained. See paragraph 3.7.4.

3.1.3. Failure of the Contractor to comply with the requirements of the Contracting Officer shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of the contract.

### **3.2. BASIS FOR PAYMENT AND COST LOADING**

The schedule shall be the basis for determining contract earnings during each update period and therefore the amount of each progress payment. Lack of an approved schedule update or qualified scheduling personnel will result in an inability of the Contracting Officer to evaluate contract earned value for the purposes of payment. Failure of the Contractor to provide all information, as specified herein will result in the disapproval of the preliminary, initial and subsequent schedule updates. In the event schedule revisions are directed by the Contracting Officer and those revisions have not been included in subsequent revisions or updates, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until such revisions to the project schedule have been made. Activity cost loading shall be reasonable as determined by the Contracting Officer. The aggregate value of all activities coded to a contract CLIN as specified herein shall equal the value of the CLIN on the Schedule.

### 3.3. PROJECT SCHEDULE DETAILED REQUIREMENTS

The computer software system utilized to produce and update the project schedule shall be capable of meeting all requirements of this specification. Failure of the Contractor to meet the requirements of this specification will result in the disapproval of the schedule. Scheduling software that meets the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER-1-1-11(1995) referenced herein are Primavera Project Planner (P3) by Primavera, and Open Plan by Deltek.

#### 3.3.1. Use of the Critical Path Method

Use the Critical Path Method (CPM) of network calculation to generate the project schedule. Prepare the project schedule using the Precedence Diagram Method (PDM).

#### 3.3.2. Level of Detail Required

Develop the project schedule to an appropriate level of detail. Failure to develop the project schedule to an appropriate level of detail, as determined by the Contracting Officer, will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

##### 3.3.2.1. Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Less than 2 percent of all non-procurement activities shall have Original Durations (OD) greater than 20 work days or 30 calendar days. Procurement activities are defined herein.

##### 3.3.2.2. Design and Permit Activities

Include design and permit activities, including necessary conferences and follow-up actions and design package submission activities. Include the design schedule in the project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific contract period. This shall be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item.

##### 3.3.2.3. Procurement Activities

Include activities associated with the submittal, approval, procurement, fabrication and delivery of long lead materials, equipment, fabricated assemblies and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days. A typical procurement sequence includes the string of activities: submit, approve/review, procure, fabricate, and deliver.

##### 3.3.2.4. Mandatory Tasks

Include and properly schedule the following tasks (See also the Sample Preliminary Submittal Register Input Form):

- (a) Submission, review and acceptance of design packages, including BIM
- (b) Submission of mechanical/electrical/information systems layout drawings
- (c) Submission and approval of O & M manuals
- (d) Submission and approval of as-built drawings
- (e) Submission and approval of 1354 data and installed equipment lists
- (f) Submission and approval of testing and air balance (TAB)
- (g) Submission of TAB specialist design review report
- (h) Submission and approval of fire protection specialist
- (i) Submission and approval of testing and balancing of HVAC plus commissioning plans and data. Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements.

- (j) Air and water balancing
- (k) HVAC commissioning
- (l) Controls testing plan submission
- (m) Controls testing
- (n) Performance Verification testing
- (o) Other systems testing, if required
- (p) Contractor's pre-final inspection
- (q) Correction of punch list from Contractor's pre-final inspection
- (r) Government's pre-final inspection
- (s) Correction of punch list from Government's pre-final inspection
- (t) Final Inspection

3.3.2.5. Government Activities. Show Government and other agency activities that could impact progress. These activities include but are not limited to: approvals, design reviews, review conferences, release for construction of design package(s), environmental permit approvals by State regulators, inspections, utility tie-ins, Government Furnished Property/Equipment (GFP) and Notice to Proceed for phasing requirements, if any.

#### 3.3.2.6. Activity Responsibility Coding (RESP)

Assign Responsibility Code for all activities to the Prime Contractor, Subcontractor or Government agency responsible for performing the activity. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements. Code all activities not coded with a Government Responsibility Code to the Prime Contractor or Subcontractor responsible to perform the work. Activities shall not have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE). Unacceptable code values are abbreviations of the names of subcontractors.

#### 3.3.2.7. Activity Work Area Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities shall not have more than one Work Area Code. Not all activities are required to be Work Area coded. A lack of Work Area coding will indicate the activity is not resource or space constrained.

#### 3.3.2.8. Contract Changes/Requests for Equitable Adjustment (REA) Coding (MODF)

Assign Activity code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer, with a Contract Changes/REA Code. Key all Code values to the Government's modification numbering system. Any activity or sequence of activities added to the schedule as a result of alleged constructive changes made by the Government may be added to a copy of the current schedule, subject to the approval of the Contracting Officer. Assign Activity codes for these activities with a Contract Changes/REA Code. Key the code values to the Contractor's numbering system. Approval to add these activities does not necessarily mean the Government accepts responsibility and therefore liability for such activities and any associated impacts to the schedule, but rather the Government recognizes such activities are appropriately added to the schedule for the purposes of maintaining a realistic and meaningful schedule. Such activities shall not be Responsibility Coded to the Government unless approved. An activity shall not have more than one Contract Changes/REA Code

#### 3.3.2.9. Contract Line Item (CLIN) Coding (BIDI)

Code all activities to the CLIN on the Contract Line Item Schedule to which the activity belongs. An activity shall not contain more than one CLIN Item Code. CLIN Item code all activities, even when an activity is not cost loaded.

#### 3.3.2.10. Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities, based upon the phase of work in which the activity occurs. Code activities to either a Design Phase or a Construction Phase. Code fast track design and construction phases proposed by the Contractor to allow filtering and organizing the schedule by fast track design and construction packages. If the contract specifies construction phasing with separately defined performance periods, identify a Construction Phase Code to allow filtering and organizing the schedule accordingly. Each activity shall have only one Phase of Work code.

#### 3.3.2.11. Category of Work Coding (CATW)

Assign Category of Work code to all Activities based upon the category of work which the activity belongs. Category of Work Code must include, but is not limited to: Design, Design Submittal, design reviews, review conferences, Construction Submittal, Approvals (if any), Acceptance, Procurement, Fabrication, Delivery, Weather Sensitive Installation, Non-Weather Sensitive Installation, Start Up, Test, and Turnover. Assign a Category of Work code to each activity. Each activity shall have only one Category of Work Code.

#### 3.3.2.12. Definable Features of Work Coding (FOW1, FOW2, FOW3)

Assign a Definable Feature of Work Code to appropriate activities based on the definable feature of work to which the activity belongs. Definable Feature of Work is defined in Specification Section 01 45 04.00 10, Contractor Quality Control. An activity shall not have more than one Definable Feature of Work Code. Not all activities are required to be Definable Feature of Work Coded.

### 3.3.3. Scheduled Project Completion and Activity Calendars

The schedule interval shall extend from NTP date to the required contract completion date. The contract completion activity (End Project) shall finish based on the required contract duration in the accepted contract proposal, as adjusted for any approved contract time extensions. The first scheduled work period shall be the day after NTP is acknowledged by the Contractor. Schedule activities on a calendar to which the activity logically belongs. Activities may be assigned to a 7 day calendar when the contract assigns calendar day durations for the activity such as a Government Acceptance activity. If the Contractor intends to perform physical work less than seven days per week, schedule the associated activities on a calendar with non-work periods identified including weekends and holidays. Assign the Category of Work Code - Weather Sensitive Installation to those activities that are weather sensitive. Original durations must account for anticipated normal adverse weather. The Government will interpret all work periods not identified as non-work periods on each calendar as meaning the Contractor intends to perform work during those periods.

#### 3.3.3.1. Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. Include as the first activity in the project schedule an activity called "Start Project" or "NTP". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, with a zero day duration.

#### 3.3.3.2. Schedule Constraints and Open Ended Logic

Constrain completion of the last activity in the schedule by the contract completion date. Schedule calculations shall result in negative float when the calculated early finish date of the last activity is later than the contract completion date. Include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the contract completion date for the project, and with a zero day duration or by using the "project must finish by" date in the scheduling software. The schedule shall have no constrained dates other than those specified in the contract. The use of artificial float constraints such as "zero free float" or "zero total float" are typically prohibited. There shall only be 2 open ended activities: Start Project (or NTP) with no predecessor logic and End Project with no successor logic.

#### 3.3.3.3. Early Project Completion

In the event the Preliminary or Initial project schedule calculates an early completion date of the last activity prior to the contract completion date, the Contractor shall identify those activities that it intends to accelerate and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. The Contractor shall include all project and site overhead expenses through the required contract duration period in the contract cost. The Contractor will not be entitled to a time extension or price adjustment for extended overhead related costs due to any delays which may affect early contract completion prior to the required contract completion date. The last activity shall have a late finish constraint equal to the contract completion date and the schedule will calculate positive float. The Government will not approve an early completion schedule with zero float on the longest path. The Government is under no obligation to accelerate activities for which it is responsible to support a proposed early contract completion.

#### 3.3.4. Interim Completion Dates

Constrain contractually specified interim completion dates to show negative float when the calculated early finish date of the last activity in that phase is later than the specified interim completion date.

##### 3.3.4.1. Start Phase

Include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

##### 3.3.4.2. End Phase

Include as the last activity for a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the specified completion date for that phase and a zero day duration.

##### 3.3.4.3. Phase "X" Hammock

Include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" hammock activity shall be logically tied to the earliest and latest activities in the phase.

#### 3.3.5. Default Progress Data Disallowed

Do not automatically update Actual Start and Finish dates with default mechanisms that may be included in the scheduling software. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the AS and AF dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's updated schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Disable program features which calculate one of these parameters from the other.

#### 3.3.6. Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule..

#### 3.3.7. Negative Lags and Start to Finish Relationships

Lag durations contained in the project schedule shall not have a negative value. Do not use Start to Finish relationships (SF).

#### 3.3.8. Calculation Mode



Schedule calculations shall retain the logic between predecessors and successors even when the successor activity starts and the predecessor activity has not finished. Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") will not be allowed.

### 3.3.9. Milestones

Include milestone activities for each significant project event including but not limited to: milestone activities for each fast track design package released for construction; design complete; foundation/substructure construction complete; superstructure construction complete; building dry-in or enclosure complete to allow the initiation of finish activities; permanent power complete; and building systems commissioning complete.

### 3.3.10. Use of Primavera "P6"

If P6 is being used, the following settings are mandatory in the Preliminary Project Schedule, Initial Project Schedule and all schedule submissions to the Government:

- 3.3.10.1. Activity Codes shall be Project Level not Global or EPS level.
- 3.3.10.2. Calendars shall be Project Level not Global or Resource level.
- 3.3.10.3. Set Activity Duration Types to "Fixed Duration & Units".
- 3.3.10.4. Set Percent Complete Types to "Physical".
- 3.3.10.5. Use Default Time Period Admin Preferences "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days. This is not to mandate the Contractor's work week. Alternate workweeks may be set up in "Calendar Settings".
- 3.3.10.6. Set Schedule Option for defining Critical Activities "Longest Path".
- 3.3.10.7. Set Schedule Option for defining progressed activities "Retained Logic".
- 3.3.10.8. Set up Cost loading a single lump sum Resource. The Price/Unit shall be \$1/hr, Default Units/Time shall be "8h/d", and select settings "Auto Compute Actuals" and "Calculate costs from units".
- 3.3.10.9. Activity ID's shall not exceed 10 characters.
- 3.3.10.10. Activity Names shall have the most defining and detailed description within the first 30 characters.

## 3.4. PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data CD, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

### 3.4.1. Preliminary Project Schedule Submission

Submit the Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days for approval within 15 calendar days after the NTP is acknowledged. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. Detail it for the first 90 calendar days. It may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as previously specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required Plan and Program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, the planned submissions of all early design packages, permitting activities, design review conference activities and other non-construction activities intended to occur within the first 90 calendar days. Schedule any construction activities planned for the first 90 calendar days after NTP. Constrain planned construction activities by Government acceptance of the associated design package(s)

and all other specified Program and Plan approvals. Activity code any activities that are summary in nature after the first 90 calendar days with Responsibility Code (RESP) and Feature of Work code (FOW1, FOW2, FOW3)

#### 3.4.2. Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after NTP. The schedule shall demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. The Initial Schedule shall be at a reasonable level of detail as determined by the Contracting Officer. Include detailed design and permitting activities, including but not limited to identification of individual design packages, design submission, reviews and conferences; permit submissions and any required Government actions; and long lead procurement activities required prior to design completion. The Initial Project Schedule shall include the entire construction sequence and all fast track construction activities, with as much detail as is known at the time but, as a minimum, shall include all construction start and completion milestone activities, and detailed construction activities through the dry-in milestone, including all activity coding and cost loading. Include the remaining construction, including cost loading, but it may be scheduled summary in nature. As the design proceeds and design packages are developed, fully detail the remaining construction activities concurrent with the monthly schedule updating process. Constrain construction activities by Government acceptance of associated designs. When the design is complete, incorporate into the then approved schedule update all remaining detailed construction activities that are planned to occur after the dry-in milestone.

#### 3.4.3. Design Package Schedule Submission:

With each design package submitted to the Government, submit a frag-net schedule extracted from the then current Preliminary, Initial or Updated schedule which covers the activities associated with that Design Package including construction, procurement and permitting activities.

#### 3.4.4. Periodic Schedule Updates

Based on the result of the meeting specified in PERIODIC SCHEDULE UPDATE MEETINGS, submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgment of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made. Update the schedule to include detailed lower WBS activities procurement and construction activities as the design progresses, but not later than the submission of the final, un-reviewed design submission for each separate design package. The Contracting Officer may require submission of detailed schedule activities for any distinct construction that is started prior to submission of a final design submission, if such activity is authorized.

#### 3.4.5. Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used. A template SDEF compatible schedule backup file (sdef.prx) is available on the QCS website: [www.rmssupport.com](http://www.rmssupport.com). The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per Day
2	RESP	4	Responsible Party (e.g. GC, subcontractor, USACE)
3	AREA	4	Area of Work
4	MODF	6	Modification or REA number
5	BIDI	6	Bid Item (CLIN)

6	PHAS	2	Phase of Work
7	CATW	1	Category of Work
8	FOW1	10	Feature of Work (used up to 10 characters in length)
9	FOW2	10	Feature of Work (used up to 20 characters in length)
10	FOW3	10	Feature of Work (used up to 30 characters in length)

### 3.5. SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

#### 3.5.1. Data CD's

Provide two sets of data CD's containing the project schedule in the backup format. Each CD shall also contain all previous update backup files. File medium shall be CD. Label each CD, indicating the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and file names. Each schedule shall have a unique file name as determined by the Contractor.

#### 3.5.2. Narrative Report

Provide a Narrative Report with the Preliminary, Initial, and each Periodic Update of the project schedule, as the basis of the progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths where the total float is less than or equal to 20 work days, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to communicate to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through its analysis. Identify and explain why any activities that, based their calculated late dates, should have either started or finished during the update period but did not.

#### 3.5.3. Approved Changes Verification

Include only those project schedule changes in the schedule submission that have been previously approved by the Contracting Officer. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

#### 3.5.4. Schedule Reports

The format, filtering, organizing and sorting for each schedule report shall be as directed by the Contracting Officer. Typically reports shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. The following lists typical reports that will be requested. One or all of these reports may be requested for each schedule submission.

##### 3.5.4.1. Activity Report

A list of all activities sorted according to activity number.

##### 3.5.4.2. Logic Report

A list of detailed predecessor and successor activities for every activity in ascending order sorted by activity number.

### 3.5.4.3. Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

### 3.5.4.4. Earnings Report by CLIN

A compilation of the Contractor's Total Earnings on the project from the NTP to the data date. This report shall reflect the earnings of specific activities based on the agreements made in the schedule update meeting defined herein. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining progress payments. Group activities by CLIN Item number and sort by activity number. This report shall: sum all activities coded to a particular CLIN and provide a CLIN Item percent earned value; and complete and sum CLIN items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

### 3.5.5. Network Diagram

The network diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

#### 3.5.5.1. Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

#### 3.5.5.2. Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

#### 3.5.5.3. Critical Path

Clearly show the critical path.

#### 3.5.5.4. Banding

Organize activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

#### 3.5.5.5. S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

### 3.6. PERIODIC SCHEDULE UPDATE MEETINGS

Conduct periodic schedule update meetings for the purposes of reviewing the Contractor's proposed out of sequence corrections, determining causes for delay, correcting logic, maintaining schedule accuracy and determining earned value. Meetings shall occur at least monthly within five days of the proposed schedule data date and after the Contractor has updated the schedule with Government concurrence respecting actual start dates, actual finish dates, remaining durations and percent complete for each activity it intend to status. Match the actual start and finish dates with the dates exported, as described in paragraph 3.3.5. Provide a computer with the scheduling software loaded and a projector during the meeting which allows all meeting participants to view the proposed schedule update during the meeting. The meeting and resultant approvable schedule update shall be a condition precedent to a formal submission of the update as described in SUBMISSION REQUIREMENTS and to the submission of an invoice for payment. The meeting will be a working interactive exchange which will allow the Government and the Contractor the opportunity review the updated schedule on a real time and interactive basis. The Contractor's authorized scheduling representative will organize, sort, filter and schedule the update as

requested by the Government. The meeting will last no longer than 8 hours. A rough draft of the proposed activity logic corrections and narrative report shall be provided to the Government 48 hours in advance of the meeting. The Contractor's Project Manager and Authorized Scheduler shall attend the meeting with the Authorized Representative of the Contracting Officer.

#### 3.6.1. Update Submission Following Progress Meeting

Submit a complete update of the project schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 working days after the periodic schedule update meeting, reflecting only those changes made during the previous update meeting.

#### 3.6.2. Status of Activities

Update status information, including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD) and Percent Complete shall be subject to the approval of the Government prior to the meeting. As a minimum, address the following items on an activity by activity basis during each progress meeting:

##### 3.6.2.1. Actual Start and Finish Dates

Accurately status the AS and/or AF dates for each activity currently in-progress or completed since the last update. The Government may allow an AF date to be assigned with the percent complete less than 100% to account for the value of work remaining but not restraining successor activities. Only assign AS dates when actual progress occurs on an activity.

##### 3.6.2.2. Remaining Duration

Update the estimated RD for all incomplete activities independent of Percent Complete. Remaining durations may exceed the activity OD or may exceed the activity's prior update RD if the Government considers the current OD or RD to be understated based on current progress, insufficient work crews actually manning the job, unrealistic OD or deficiencies that must be corrected that restrain successor activities.

##### 3.6.2.3. Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be statused 100 percent complete. To allow for proper schedule management, cost load the correction of punch list from Government pre-final inspection activity(ies) not less than 1% of the total contract value, which activity(ies) may be declared 100 percent complete upon completion and correction of all punch list work identified during Government pre-final inspection(s).

##### 3.6.2.4. Logic Changes

Specifically identify and discuss all logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, and other changes that have been made pursuant to contract provisions. The Government will only approve logic revisions for the purpose of keeping the schedule valid in terms of its usefulness in calculating a realistic completion date, correcting erroneous logic ties, and accurately sequencing the work.

##### 3.6.2.5. Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule that does not represent the actual or planned prosecution and progress of the work.

#### 3.7. REQUESTS FOR TIME EXTENSIONS

In the event the Contractor believes it is entitled to an extension of the contract performance period, completion date, or any interim milestone date, furnish the following for a determination by the Contracting Officer: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of excusable delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is a condition precedent to any approvals by the Government. In response to each Request For Proposal issued by the Government, the Contractor shall submit a schedule impact analysis demonstrating whether or not the change contemplated by the Government impacts the critical path.

#### 3.7.1. Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with its request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. The Contractor will not be entitled to a time extension or price adjustment for extended overhead related costs due to any delays which may affect early contract completion prior to the required contract completion date.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, will not be a cause for an extension to the performance period, completion date, or any interim milestone date.

#### 3.7.2. Submission Requirements

Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

3.7.2.1. A list of affected activities, with their associated project schedule activity number.

3.7.2.2. A brief explanation of the causes of the change

3.7.2.3. An analysis of the overall impact of the changes proposed.

3.7.2.4. A sub-network of the affected area

Identify activities impacted in each justification for change by a unique activity code contained in the required data file.

#### 3.7.3. Additional Submission Requirements

The Contracting Officer may request an interim update with revised activities for any requested time extension of over 2 weeks. Provide this disk within 4 days of the Contracting Officer's request.

#### 3.7.4. If Progress Falls Behind the Approved Project Schedule

3.7.4.1. Should progress fall behind the approved schedule (more than 20 work days of negative float) due to Contractor generated problems, promptly provide a supplemental recovery or completion schedule that illustrates its efforts to regain time to assure a completion by the required contract completion date.

3.7.4.2. The supplemental recovery or completion schedule will not replace the original, approved schedule as the official contract schedule. Continue to update the original, approved schedule on at least a monthly basis. In addition, the Contractor and the Contracting Officer will monitor the supplemental recovery or completion schedule on at least a bi-weekly basis to determine its effect on regaining the rate of progress to assure project completion by the contractually required completion date.

3.7.4.3. Do not artificially improve progress by simply revising the schedule logic, modifying or adding constraints, or shortening future work activity durations. Resource and manpower load the supplemental recovery schedule or completion schedule with crew size and productivity for each remaining activity, indicating overtime, weekend work,

and/or double shifts needed to regain the schedule, in accordance with FAR 52.236.15, without additional cost to the Government. Indicate assumptions made and the basis for any logic, constraint, or duration changes used in the creation of the supplemental recovery or completion schedule in a narrative submitted for the Contracting Officer's approval. Any additional resources or manpower must be evident at the work site. Do not modify the official contract schedule to include these assumptions.

3.7.4.4. Failure to perform work and maintain progress in accordance with the supplemental recovery or completion schedule may result in an interim and final unsatisfactory performance rating and/or may result in corrective action by the Contracting Officer in accordance with FAR 52.236-15.

### 3.8. DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The Contracting Officer will approve proposed revisions to the schedule prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

### 3.9. WEEKLY PROGRESS MEETINGS

3.9.1. The Government and the Contractor shall meet weekly (or as otherwise mutually agreed to) between the meetings described in paragraph PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. The then current and approved schedule update shall be used for the purposes of this meeting and for the production and review of reports. The Contractor's Project Manager and the Authorized Representative of the Contracting Officer shall attend. The weekly progress meeting will address the status of RFI's, RFP's and Submittals.

3.9.2. Provide a bar chart produced by the scheduling software, organized by Total Float and Sorted by Early Start Date, and a two week "look-ahead" schedule by filtering all schedule activities to show only current ongoing activities and activities schedule to start during the upcoming two weeks, organized by Work Area Code (AREA) and sorted by Early Start Date.

3.9.3. The Government and the Contractor shall jointly review the reports. If it appears that activities on the longest path(s) which are currently driving the calculated completion date (driving activities), are not progressing satisfactorily and therefore could jeopardize timely project completion, corrective action must be taken immediately. Corrective action includes but is not limited to: increasing the number of work crews; increasing the number of work shifts; increasing the number of hours worked per shift; and determining if Government responsibility coded activities require Government corrective action.

### 3.10. OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

### 3.11. TRANSFER OF SCHEDULE DATA INTO RMS/QCS

Download and upload the schedule data into the Resident Management System (RMS) prior to RMS databases being transferred to the Government and is considered to be additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 - Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 - Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and electronic export from QCS of the application for progress payment.

End of Section 01 32 01.00 10



**SECTION 01 33 00  
SUBMITTAL PROCEDURES**

**1.0 GENERAL**

- 1.1. DEFINITIONS
- 1.2. NOT USED
- 1.3. SUBMITTAL CLASSIFICATION
- 1.4. APPROVED OR CONCURRED WITH SUBMITTALS
- 1.5. DISAPPROVED SUBMITTALS
- 1.6. WITHHOLDING OF PAYMENT
- 1.7. GENERAL
- 1.8. SUBMITTAL REGISTER
- 1.9. SCHEDULING
- 1.10. TRANSMITTAL FORM (ENG FORM 4025)
- 1.11. SUBMITTAL PROCEDURES
- 1.12. CONTROL OF SUBMITTALS
- 1.13. GOVERNMENT APPROVED SUBMITTALS
- 1.14. INFORMATION ONLY SUBMITTALS
- 1.15. STAMPS

## 1.0 GENERAL

### 1.1. DEFINITIONS

#### 1.1.1. Submittal

Contract Clauses "FAR 52.236-5, Material and Workmanship," paragraph (b) and "FAR 52.236-21, Specifications and Drawings for Construction," paragraphs (d), (e), and (f) apply to all "submittals."

#### 1.1.2. Submittal Descriptions (SD)

Submittals requirements are specified in the technical sections. Submittals are identified by SD numbers and titles as follows.

##### SD-01 Preconstruction Submittals

- Certificates of insurance.
- Surety bonds.
- List of proposed subcontractors.
- List of proposed products.
- Construction Progress Schedule.
- Submittal register.
- Schedule of prices.
- Accident Prevention Plan.
- Work plan.
- Quality control plan.
- Environmental protection plan.

##### SD-02 Shop Drawings

- Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.
- Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
- Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

##### SD-03 Product Data

- Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.
- Samples of warranty language when the contract requires extended product warranties.

##### SD-04 Samples

- Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
- Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
- Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those which will be removed at conclusion of the work.

##### SD-05 Design Data

- Calculations, mix designs, analyses or other data pertaining to a part of work.
- Design submittals, design substantiation submittals and extensions of design submittals.

##### SD-06 Test Reports

- Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must

have been within three years of date of contract award for the project.)

- Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.
- Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
- Investigation reports.
- Daily checklists.
- Final acceptance test and operational test procedure.

#### SD-07 Certificates

- Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
- Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.
- Confined space entry permits.
- Text of posted operating instructions.

#### SD-08 Manufacturer's Instructions

- Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

#### SD-09 Manufacturer's Field Reports

- Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- Factory test reports.

#### SD-10 Operation and Maintenance Data

- Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

#### SD-11 Closeout Submittals

- Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

##### 1.1.3. Approving Authority

Office authorized to approve submittal.

##### 1.1.4. Work

As used in this section, on- and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction.

##### 1.2. NOT USED

##### 1.3. SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

##### 1.3.1. Designer of Record Approved (DA)

1.3.1.1. Designer of Record (DOR) approval is required for all extensions of design, critical materials, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". Provide the Government the number of copies designated hereinafter of all DOR approved submittals, after the DOR has taken appropriate action. The DOR shall ensure that submittals conform to the Solicitation, the Accepted Proposal and the completed design, however see below for those submittals proposing a deviation to the contract or a substitution of a material, system, or piece of equipment that was identified by manufacturer, brand name or model description in the accepted contract proposal.

1.3.1.2. The DOR shall ensure that the submittals comply with all applicable Buy American Act and Trade Agreement Act clauses in the contract. The DOR may confer with the Contracting Officer's Representative for advice and interpretation of those clauses, as necessary.

1.3.1.3. The Government may, but is not required to, review any or all DOR approved submittals for conformance to the solicitation, accepted proposal and the completed design. Except for submittals designated as deviating from the Solicitation, the Accepted Proposal or completed design, the Contractor may proceed with acquisition and installation upon DOR approval. Government Approved (GA)

#### 1.3.2. Government Approved (GA)

Government approval is required for any item specifically designated as requiring Government approval in the Solicitation, for internal and external color finish selections and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

#### 1.3.3. Government Conformance Review of Design (CR)

The Government will review all intermediate and final design submittals for conformance with the technical requirements of the solicitation. Section 01 33 16 **DESIGN AFTER AWARD** covers the design submittal and review process in detail. Review will be only for conformance with the applicable codes, standards and contract requirements. Design data includes the design documents described in Section 01 33 16 **DESIGN AFTER AWARD**. Generally, design submittals should be identified as SD-05 Design Data submittals.

#### 1.3.4. Designer of Record Approved/Government Conformance Review (DA/CR)

1.3.4.1. Deviations to the Accepted Design. Designer of Record approval and the Government's concurrence are required for any proposed deviation from the accepted design which still complies with the contract (the Solicitation and Accepted Proposal) before the Contractor is authorized to proceed with material acquisition or installation. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings." If necessary to facilitate the project schedule, the Contractor and the DOR may discuss a submittal proposing a deviation with the Contracting Officer's Representative prior to officially submitting it to the Government. However, the Government reserves the right to review the submittal before providing an opinion, if it deems it necessary. In any case, the Government will not formally agree to or provide a preliminary opinion on any deviation without the DOR's approval or recommended approval. The Government reserves the right to non-concur with any deviation from the design, which may impact furniture, furnishings, equipment selections or operations decisions that were made, based on the reviewed and concurred design.

1.3.4.2. Substitutions. Unless prohibited or provided for otherwise elsewhere in the Contract, where the accepted contract proposal named products, systems, materials or equipment by manufacturer, brand name and/or by model number or other specific identification, and the Contractor desires to substitute manufacturer or model after award, submit a requested substitution for Government concurrence. Include substantiation, identifying information and the DOR's approval, as meeting the contract requirements and that it is equal in function, performance, quality and salient features to that in the accepted contract proposal.

#### 1.3.5. Designer of Record Approved/Government Approved (DA/GA)

Any proposed deviation to the solicitation and/or the accepted proposal constitutes a change to the contract. In addition to the above stated requirements for proposed deviations to the accepted design, both Designer of Record and Government Approval and, where applicable, a contract modification are required before the Contractor is

authorized to proceed with material acquisition or installation for any proposed deviation to the contract. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Government reserves the right to accept or reject any such proposed deviation at its discretion.

#### 1.3.6. Information Only

All submittals not requiring Designer of Record or Government approval will be for information only. Provide the Government "For Information Only" copies of all submittals not requiring Government approval or concurrence, after the Designer of Record has taken the appropriate action.

#### 1.4. APPROVED OR CONCURRED WITH SUBMITTALS

Do not construe the Contracting Officer's approval of or concurrence with submittals as a complete check, but only that design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Approval or concurrence will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. The Government won't consider re-submittals for the purpose of substituting previously approved materials or equipment unless accompanied by an explanation of why a substitution is necessary.

#### 1.5. DISAPPROVED SUBMITTALS

Make all corrections required by the Contracting Officer, obtain the Designer of Record's approval when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Resubmit any "information only" submittal found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal as one requiring "approval" action, requiring both Designer of Record and Government approval. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, provide prompt notice in accordance with the Contract Clause "Changes" to the Contracting Officer.

#### 1.6. WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer of Record or required Government approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

#### 1.7. GENERAL

Make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, the Contractor's Quality Control (CQC) System Manager and the Designer of Record, if applicable, shall check, approve, sign, and stamp all items, indicating action taken. Clearly identify proposed deviations from the contract requirements. Include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Schedule and make submittals requiring Government approval prior to the acquisition of the material or equipment covered thereby. Pick up and dispose of samples remaining upon completion of the work in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

#### 1.8. SUBMITTAL REGISTER (GA)

Develop a complete list of submittals, including each separate design package submittal. Submit the initial submittal register within 15 days after Notice to Proceed, including, as a minimum, the design packages and other initial submittals required elsewhere in the contract. The Designer of Record shall identify required submittals in the

specifications, and use the list to prepare the Submittal Register, utilizing the government-provided software, QCS (see Section 01 45 01.10), to create the ENG Form 4288. Appendix R is a preliminary submittal register input form for use with the Quality Management System and the Resident Office Management System (QCS and RMS). The Government will provide the Contractor the actual Excel Spreadsheet version of this sample input form after award to modify and to use for input into QCS. The Excel Spreadsheet is not totally inputable into QCS, so additional keystroke input will be necessary. The sample input form is not all-inclusive. In addition, additional submittals may be required by other parts of the contract. After award, the parties will meet to discuss contract specific (or task order specific for a task order contract) distribution for the submittals all-inclusive and additional submittals may be required by other parts of the contract. Develop and complete the submittal register as the design is completed. Submit it to the Contracting Officer with the un-reviewed final design package submission or as soon as the design specifications are completed, if before the final design submission. When applicable, if the Contractor elects to fast track design and construction, using multiple design package submissions, update the submittal register to reflect the submittals associated with each design submission, clearly denoting all revisions to the previous submission. The submittal register serves as a scheduling document for submittals and for control of submittal actions throughout the contract period. Coordinate the submit dates and need dates used in the submittal register with dates in the Contractor prepared progress schedule. Submit monthly updates to the submittal register showing the Contractor action codes and actual dates with Government action codes and actual dates or until all submittals have been satisfactorily completed. Revise and submit the submittal register when revising the progress schedule.

#### 1.9. SCHEDULING

Schedule submittals covering component items forming a system or items that are interrelated to be coordinated and submitted concurrently. Schedule certifications to be submitted with the pertinent drawings. Allow adequate time (a minimum of 15 calendar days exclusive of mailing time) and show on the register for those items requiring Government approval or concurrence. No delay damages or time extensions will be allowed for time lost in late submittals by the Contractor.

#### 1.10. TRANSMITTAL FORM (ENG FORM 4025)

Use the transmittal form (ENG Form 4025) for submitting submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor or are included in the QCS software if the Contractor is required to use QCS for this contract. Use a separate transmittal form for each specification section. Complete this form by filling out all the heading blank spaces and identify each item submitted. Exercise special care to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

#### 1.11. SUBMITTAL PROCEDURES

Make submittals as follows:

##### 1.11.1. Procedures

The Government will further discuss detailed submittal procedures with the Contractor at the Post-Award Conference.

##### 1.11.2. Deviations

For submittals which include proposed deviations requested by the Contractor, check the column "variation" of ENG Form 4025. Set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

#### 1.12. CONTROL OF SUBMITTALS

Carefully control his procurement operations to ensure that each individual submittal is made on or before the scheduled submittal date shown on the approved "Submittal Register."

#### 1.13. GOVERNMENT APPROVED OR CONCURRED WITH SUBMITTALS

Upon completion of review of submittals requiring Government approval or concurrence, the Government will stamp and date the submittals as approved or concurred.. The Government will retain one (1) copies of the submittal and return zero(0) copy(ies) of the submittal.

#### 1.14. INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe. The Government will retain zero(0) copies of information only submittals.

#### 1.15. STAMPS

Use stamps similar to the following on the submittal data to certify that the submittal meets contract requirements:

CONTRACTOR

(FIRM NAME)

Approved

Approved with corrections as noted on submittal data and/or attached  
sheet(s)

Signature:

Title:

Date:

**For design-build construction, both the Contractor Quality Control System Manager and the Designer of Record shall stamp and sign to certify that the submittal meets contract requirements.**

**SECTION 01 33 16  
DESIGN AFTER AWARD**

**1.0 GENERAL INFORMATION**

1.1. INTRODUCTION

1.2. DESIGNER OF RECORD

**2.0 PRODUCTS (Not Applicable)**

**3.0 EXECUTION**

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3.1.2. Post Award Conference

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3.2.5. Design Complete Submittals

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3.4.2. Procedures

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3.5. INTERIM DESIGN REQUIREMENTS

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3.5.7. Building Rendering

3.5.8. Interim Building Design Contents

3.6. FINAL DESIGN REVIEWS AND CONFERENCES

3.7. FINAL DESIGN REQUIREMENTS

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3.7.2. Design Analysis

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3.7.4. Submittal Register

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3.7.6. Acceptance and Release for Construction

3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

3.9.1. Submittal Distribution and Quantities

3.9.2. Web based Design Submittals

3.9.3. Mailing of Design Submittals

3.10. AS-BUILT DOCUMENTS

**ATTACHMENT A STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS**

**ATTACHMENT B FURNITURE, FIXTURES AND EQUIPMENT REQUIREMENTS**

**ATTACHMENT C TRACKING COMMENTS IN DRCHECKS**

**ATTACHMENT D SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW**

**ATTACHMENT E LEED SUBMITTALS**

**ATTACHMENT F BUILDING INFORMATION MODELING REQUIREMENTS**

**ATTACHMENT G DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT**

## **1.0 GENERAL INFORMATION**

### **1.1. INTRODUCTION**

1.1.1. The information contained in this section applies to the design required after award. After award, the Contractor will develop the accepted proposal into the completed design, as described herein.

1.1.2. The Contractor may elect to fast track the design and construction that is, proceed with construction of parts of the sitework and facilities prior to completion of the overall design. To facilitate fast tracking, the Contractor may elect to divide the design into no more than six (6) design packages per major facility type and no more than three (3) design packages for site and associated work. Designate how it will package the design, consistent with its overall plan for permitting (where applicable) and construction of the project. See Sections 01 33 00 SUBMITTAL PROCEDURES and 01 32 01.00 10 PROJECT SCHEDULE for requirements for identifying and scheduling the design packaging plan in the submittal register and project schedule. See also Sections 01 10 00 STATEMENT OF WORK and 01 57 20.00 10 ENVIRONMENTAL PROTECTION for any specified permit requirements. If early procurement of long-lead item construction materials or installed equipment, prior to completion of the associated design package, is necessary to facilitate the project schedule, also identify those long-lead items and how it will assure design integrity of the associated design package to meet the contract requirements (The Contract consists of the Solicitation requirements and the accepted proposal). Once the Government is satisfied that the long-lead items meet the contract requirements, the Contracting Officer will allow the Contractor to procure the items at its own risk.

1.1.3. The Contractor may proceed with the construction work included in a separate design package after the Government has reviewed the final (100%) design submission for that package, review comments have been addressed and resolved to the Government's satisfaction and the Contracting Officer (or the Administrative Contracting Officer) has agreed that the design package may be released for construction.

1.1.4. **INTEGRATED DESIGN.** To the maximum extent permitted for this project, use a collaborative, integrated design process for all stages of project delivery with comprehensive performance goals for siting, energy, water, materials and indoor environmental quality and ensures incorporation of these goals. Consider all stages of the building lifecycle, including deconstruction.

### **1.2. DESIGNER OF RECORD**

Identify, for approval, the Designer of Record ("DOR") that will be responsible for each area of design. One DOR may be responsible for more than one area. Listed, Professional Registered, DOR(s) shall account for all areas of design disciplines. The DOR's shall stamp, sign, and date each design drawing and other design deliverables under their responsible discipline at each design submittal stage (see contract clause Registration of Designers). If the deliverables are not ready for release for construction, identify them as "preliminary" or "not for release for construction" or by using some other appropriate designation. The DOR(s) shall also be responsible for maintaining the integrity of the design and for compliance with the contract requirements through construction and documentation of the as-built condition by coordination, review and approval of extensions of design, material, equipment and other construction submittals, review and approval or disapproval of requested deviations to the accepted design or to the contract, coordination with the Government of the above activities, and by performing other typical professional designer responsibilities.

## **2.0 PRODUCTS (Not Applicable)**

## **3.0 EXECUTION**

### **3.1. PRE-WORK ACTIVITIES & CONFERENCES**

#### **3.1.1. Design Quality Control Plan**

Submit for Government acceptance, a Design Quality Control Plan in accordance with Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL before design may proceed.

#### **3.1.2. Post Award Conference**

3.1.2.1. The government will conduct a post award contract administration conference at the project site, as soon as possible after contract award. This will be coordinated with issuance of the contract notice to proceed (NTP). The Contractor and major sub-contractor representatives shall participate. All designers need not attend this first meeting. Government representatives will include COE project delivery team members, facility users, facility command representatives, and installation representatives. The Government will provide an agenda, meeting goals, meeting place, and meeting time to participants prior to the meeting.

3.1.2.2. The post award conference shall include determination and introduction of contact persons, their authorities, contract administration requirements, discussion of expected project progress processes, and coordination of subsequent meetings for quality control (see Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL), Partnering (see below and SCR: Partnering), and the initial design conference (see below).

3.1.2.3. The government will introduce COE project delivery team members, facility users, facility command representatives, and installation representatives. The DB Contractor shall introduce major subcontractors, and other needed staff. Expectations and duties of each person shall be defined for all participants. A meeting roster shall be developed and distributed by the government with complete contact information including name, office, project role, phone, mailing and physical address, and email address.

### 3.1.3. Partnering & Project Progress Processes

3.1.3.1. The initial Partnering conference may be scheduled and conducted at any time with or following the post award conference. The Government proposes to form a partnership with the DB Contractor to develop a cohesive building team. This partnership will involve the COE project delivery team members, facility users, facility command representatives, installation representatives, Designers of Record, major subcontractors, contractor quality control staff, and contractor construction management staff. This partnership will strive to develop a cooperative management team drawing on the strengths of each team member in an effort to achieve a quality project within budget and on schedule. This partnership will be bilateral in membership and participation will be totally voluntary. All costs, excluding labor and travel expenses, shall be shared equally between the Government and the Contractor. The Contractor and Government shall be responsible for their own labor and travel costs. Normally, partnering meetings will be held at or in the vicinity of the project installation.

3.1.3.2. As part of the partnering process, the Government and Contractor shall develop, establish, and agree to comprehensive design development processes including conduct of conferences, expectations of design development at conferences, fast-tracking, design acceptance, Structural Interior Design (SID)/ Furniture, Fixtures & Equipment (FF&E) design approval, project closeout, etc. The government will explain contract requirements and the DB Contractor shall review their proposed project schedule and suggest ways to streamline processes.

### 3.1.4. Initial Design Conference

The initial design conference may be scheduled and conducted at the project installation any time after the post award conference, although it is recommended that the partnering process be initiated with or before the initial design conference. Any design work conducted after award and prior to this conference should be limited to site and is discouraged for other items. All Designers of Record shall participate in the conference. The purpose of the meeting is to introduce everyone and to make sure any needs the contractor has are assigned and due dates established as well as who will get the information. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning the BIM Implementation Plan demonstration at this meeting. The DB Contractor shall conduct the initial design conference.

### 3.1.5. Pre-Construction Conference

Before starting construction activities, the Contractor and Government will jointly conduct a pre-construction administrative conference to discuss any outstanding requirements and to review local installation requirements for start of construction. It is possible there will be multiple Pre-Construction Conferences based on the content of the design packages selected by the Contractor. The Government will provide minutes of this meeting to all participants.

## 3.2. STAGES OF DESIGN SUBMITTALS AND OVER THE SHOULDER PROGRESS REVIEWS

The stages of design submittals described below define Government expectations with respect to process and content. The Contractor shall determine how to best plan and execute the design and review process for this project, within the parameters listed below. As a minimum, the Government expects to see at least one interim design submittal, at least one final design submittal before construction of a design package may proceed and at least one Design Complete submittal that documents the accepted design. The Contractor may sub-divide the design into separate packages for each stage of design and may proceed with construction of a package after the Government accepts the final design for that package. See discussion on waivers to submission of one or more intermediate design packages where the parties partner during the design process. See also Attachment F, BUILDING INFORMATION MODELING REQUIREMENTS for discussion concerning BIM and the various stages of design submittals and over-the-shoulder progress reviews.

### 3.2.1. Site/Utilities

To facilitate fast-track design-construction activities the contractor may submit a final (100%) site and utility design as the first design submittal or it may elect to submit interim and final site and utility design submittals as explained below. Following review, resolution, and incorporation of all Government comments, and submittal of a satisfactory set of site/utility design documents, after completing all other pre-construction requirements in this contract and after the pre-construction meeting, the Government will allow the Contractor to proceed with site development activities, including demolition where applicable, within the parameters set forth in the accepted design submittal. For the first site and utility design submission, whether an interim or final, the submittal review, comment, and resolution times from this specification apply, except that the Contractor shall allow the Government a 14 calendar day review period, exclusive of mailing time. No on-site construction activities shall begin prior to written Government clearance to proceed.

### 3.2.2. Interim Design Submittals

The Contractor may submit either a single interim design for review, representing a complete package with all design disciplines, or split the interim design into smaller, individual design packages as it deems necessary for fast-track construction purposes. As required in Section 01 32 01.00 10 PROJECT SCHEDULE, the Contractor shall schedule its design and construction packaging plan to meet the contract completion period. This submission is the Government's primary opportunity to review the design for conformance to the solicitation and to the accepted contract proposal and to the Building Codes at a point where required revisions may be still made, while minimizing lost design effort to keep the design on track with the contract requirements. The requirements for the interim design review submittals and review conferences are described hereinafter. This is not necessarily a hold point for the design process; the Contractor may designate the interim design submittal(s) as a snapshot and proceed with design development at its own risk. See below for a waiver, where the parties establish an effective over-the-shoulder progress review procedure through the partnering process that would eliminate the need for or expedite a formal intermediate design review on one or more individual design packages.

### 3.2.3. Over-the-Shoulder Progress Reviews

To facilitate a streamlined design-build process, the Government and the Contractor may agree to one-on-one reviewer or small group reviews, electronically, on-line (if available within the Contractor's standard design practices) or at the Contractor's design offices or other agreed location, when practicable to the parties. The Government and Contractor will coordinate such reviews to minimize or eliminate disruptions to the design process. Any data required for these reviews shall normally be provided in electronic format, rather than in hard copy. If the Government and Contractor establish and implement an effective, mutually agreeable partnering procedure for regular (e.g., weekly) over-the shoulder review procedures that allow the Government reviewers the opportunity to keep fully informed of the progress, contents, design intent, design documentation, etc. of the design package, the Government will agree to waive or to expedite the formal intermediate design review period for that package. The Contractor shall still be required to submit the required intermediate design documentation, however the parties may agree to how that material will be provided, in lieu of a formal consolidated submission of the package. It should be noted that Government funding is extremely limited for non-local travel by design reviewers, so the maximum use of virtual teaming methods must be used. Some possible examples include electronic file sharing, interactive software with on-line or telephonic conferencing, televideo conferencing, etc. The Government must still perform its Code and Contract conformance reviews, so the Contractor is encouraged to partner with the reviewers to find ways to facilitate this process and to facilitate meeting or bettering the design-build schedule. The Contractor shall maintain a fully functional configuration management system as described herein to track design revisions, regardless of whether or not there is a need for a formal intermediate design review. The formal intermediate

review procedures shall form the contractual basis for the official schedule, in the event that the partnering process determines that the formal intermediate review process to be best suited for efficient project execution. However, the Government pledges to support and promote the partnering process to work with the Contractor to find ways to better the design schedule.

#### 3.2.4. Final Design Submissions

This submittal is required for each design package prior to Government acceptance of that design package for construction. The requirements for the final design submittal review conferences and the Government's acceptance for start of construction are described herein after.

#### 3.2.5. Design Complete Submittals

After the final design submission and review conference for a design package, revise the design package to incorporate the comments generated and resolved in the final review conferences, perform and document a back-check review and submit the final, design complete documents, which shall represent released for construction documents. The requirements for the design complete submittals are described hereinafter.

#### 3.2.6. Holiday Periods for Government Review or Actions

Do not schedule meetings, Government reviews or responses during the last two weeks of December or other designated Government Holidays (including Friday after Thanksgiving). Exclude such dates and periods from any durations specified herein for Government actions.

#### 3.2.7. Late Submittals and Reviews

If the Contractor cannot meet its scheduled submittal date for a design package, it must revise the proposed submittal date and notify the government in writing, at least one (1) week prior to the submittal, in order to accommodate the Government reviewers' other scheduled activities. If a design submittal is over one (1) day late in accordance with the latest revised design schedule, or if notification of a proposed design schedule change is less than seven (7) days from the anticipated design submission receipt date, the Government review period may be extended up to seven (7) days due to reviewers' schedule conflicts. If the Government is late in meeting its review commitment and the delay increases the Contractor's cost or delays completion of the project, the Suspension of Work and Defaults clauses provide the respective remedy or relief for the delay.

### 3.3. DESIGN CONFIGURATION MANAGEMENT

#### 3.3.1. Procedures

Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. During the design process, this will facilitate and help streamline the design and review schedule. After the final design is accepted, this process provides control of and documents revisions to the accepted design (See Special Contract Requirement: Deviating From the Accepted Design). The system shall include appropriate authorities and concurrences to authorize revisions, including documentation as to why the revision must be made. Include the DCM procedures in the Design Quality Control Plan. The DCM data shall be available to the Government reviewers at all times. The Contractor may use its own internal system with interactive Government concurrences, where necessary or may use the Government's "DrChecks Design Review and Checking System" (see below and Attachment C).

#### 3.3.2. Tracking Design Review Comments

Although the Contractor may use its own internal system for overall design configuration management, the Government and the Contractor shall use the DrChecks Design Review and Checking System to initiate, respond to, resolve and track Government design compliance review comments. This system may be useful for other data which needs to be interactive or otherwise available for shared use and retrieval. See Attachment C for details on how to establish an account and set-up the DrChecks system for use on the project.

#### 3.3.3. Design and Code Checklists

Develop and complete various discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists with each design submittal, as applicable, as part of the project documentation. See Section 01 45 04.00 10 Contractor Quality Control, Attachment D for a Sample Fire Protection and Life Safety Code review checklist and Attachment E for LEED SUBMITTALS.

### 3.4. INTERIM DESIGN REVIEWS AND CONFERENCES

#### 3.4.1. General

At least one interim design submittal, review and review conference is required for each design package (except that, per paragraph 3.2.1, the Contractor may skip the interim design submission and proceed directly to final design on the sitework and utilities package). The DB Contractor may include additional interim design conferences or over-the-shoulder reviews, as needed, to assure continued government concurrence with the design work. Include the interim submittal review periods and conferences in the project schedule and indicate what part of the design work is at what percentage of completion. The required interim design conferences shall be held when interim design requirements are reached as described below. See also Paragraph: **Over-the-Shoulder Progress Reviews** for a waiver to the formal interim design review.

#### 3.4.2. Procedures

After receipt of an Interim Design submission, allow the Government fourteen (14) calendar days after receipt of the submission to review and comment on the interim design submittal. For smaller design packages, especially those that involve only one or a few separate design disciplines, the parties may agree on a shorter review period or alternative review methods (e.g., over-the-shoulder or electronic file sharing), through the partnering process. For each interim design review submittal, the COR will furnish, to the Contractor, a single consolidated, validated listing of all comments from the various design sections and from other concerned agencies involved in the review process using the DrChecks Design Review and Checking System. The review will be for conformance with the technical requirements of the solicitation and the Contractor's RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he/she must clearly outline, with ample justification, the reasons for noncompliance within five (5) days after receipt of these comments in order that the comment can be resolved. Furnish disposition of all comments, in writing, through DrChecks. The Contractor is cautioned that if it believes the action required by any comment exceeds the requirements of this contract, that it should take no action and notify the COR in writing immediately. The Interim Review conference will be held for each design submittal at the installation. Bring the personnel that developed the design submittal to the review conference. The conference will take place the week after the receipt of the comments by the Contractor. For smaller fast-track packages that involve only a few reviewers, the parties may agree to alternative conferencing methods, such as teleconferencing, or televideo, where available, as determined through Partnering.

#### 3.4.3. Conference Documentation

3.4.3.1. In order to facilitate and accelerate the Government code and contract conformance reviews, identify, track resolution of and maintain all comments and action items generated during the design process and make this available to the designers and reviewers prior to the Interim and subsequent design reviews.

3.4.3.2. The DB Contractor shall prepare meeting minutes and enter final resolution of all comments into DrChecks. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Incorporate valid comments. The Government reserves the right to reject design document submittals if comments are significant. Participants shall determine if any comments are critical enough to require further design development prior to government concurrence. Participants shall also determine how to proceed in order to obtain government concurrence with the design work presented.

### 3.5. INTERIM DESIGN REQUIREMENTS

Interim design deliverables shall include drawings, specifications, and design analysis for the part of design that the Contractor considers ready for review.

#### 3.5.1. Drawings

Include comments from any previous design conferences incorporated into the documents to provide an interim design for the "part" submitted.

### 3.5.2. Design Analyses

3.5.2.1. The designers of record shall prepare and present design analyses with calculations necessary to substantiate and support all design documents submitted. Address design substantiation required by the applicable codes and references and pay particular attention to the following listed items:

3.5.2.2. For parts including sitework, include site specific civil calculations.

3.5.2.3. For parts including structural work, include structural calculations.

- (a) Identify all loads to be used for design.
- (b) Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.
- (c) Provide calculations for all principal roof, floor, and foundation members and bracing and secondary members.
- (d) Provide complete seismic analyses for all building structural, mechanical, electrical, architectural, and building features as dictated by the seismic zone for which the facility is being constructed.
- (e) Computer generated calculations must identify the program name, source, and version. Provide input data, including loads, loading diagrams, node diagrams, and adequate documentation to illustrate the design. The schematic models used for input must show, as a minimum, nodes/joints, element/members, materials/properties, and all loadings, induced settlements/deflections, etc., and a list of load combinations. Include an output listing for maximum/minimum stresses/forces and deflections for each element and the reactions for each loading case and combination.
- (f) See also the Security (Anti-Terrorism) requirements below for members subject to Anti-Terrorist Force Protection (ATFP) and Progressive Collapse requirements.
- (g) Fully coordinate and integrate the overall structural design between two different or interfacing construction types, such as modular and stick-built or multistory, stacked modular construction. Provide substantiation of structural, consolidation/settlement analysis, etc., as applicable, through the interfaces.

3.5.2.4. For Security (Anti-Terrorism): Provide a design narrative and calculations where applicable, demonstrating compliance with each of the 22 standards in UFC 4-010-01, which includes Design of Buildings to Resist Progressive Collapse (use the most recent version of UFC 4-023-03, regardless of references to any specific version in UFC 4-010-01). Where sufficient standoff distance is not being provided, show calculations for blast resistance of the structural system and building envelope. Show complete calculations for members subjected to ATFP loads, e.g., support members of glazed items (jambes, headers, sills) connections of windows to support members and connections of support members to the rest of the structure. For 3 story and higher buildings, provide calculations to demonstrate compliance with progressive collapse requirements.

3.5.2.5. For parts including architectural work, include building floor area analysis.

3.5.2.6. For parts including mechanical work, include HVAC analysis and calculations. Include complete design calculations for mechanical systems. Include computations for sizing equipment, compressed air systems, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation is required (see paragraph 3.5.5.2 for list of acceptable software). Based on the results of calculations, provide a complete list of the materials and equipment proposed with the manufacturer's published cataloged product installation specifications and roughing-in data.

3.5.2.7. For parts including life safety, include building code analysis and sprinkler and other suppression systems. Notwithstanding the requirements of the Codes, address the following:

- (a) A registered fire protection engineer (FPE) must perform all fire protection analyses. Provide the fire protection engineer's qualifications. See Section 01 10 00, paragraph 5 for qualifications.



- (b) Provide all references used in the design including Government design documents and industry standards used to generate the fire protection analysis.
- (c) Provide classification of each building in accordance with fire zone, building floor areas and height and number of stories.
- (d) Provide discussion and description of required fire protection requirements including extinguishing equipment, detection equipment, alarm equipment and water supply. Alarm and detection equipment shall interface to requirements of Electronic Systems.
- (e) Provide hydraulic calculations based on water flow test for each sprinkler system to insure that flow and pressure requirements can be met with current water supply. Include copies of Contractor's water flow testing done to certify the available water source.

3.5.2.8. For parts including plumbing systems:

- (a) List all references used in the design.
- (b) Provide justification and brief description of the types of plumbing fixtures, piping materials and equipment proposed for use.
- (c) Detail calculations for systems such as sizing of domestic hot water heater and piping; natural gas piping; LP gas piping and tanks, fuel oil piping and tanks, etc., as applicable.
- (d) When the geotechnical report indicates expansive soils are present, indicate in the first piping design submittal how piping systems will be protected against damage or backfall/backflow due to soil heave (from penetration of slab to the 5 foot building line).

3.5.2.9. For elevator systems:

- (a) List all criteria codes, documents and design conditions used.
- (b) List any required permits and registrations for construction of items of special mechanical systems and equipment.

3.5.2.10. For parts including electrical work, include lighting calculations to determine maintained foot-candle levels, electrical load analysis and calculations, electrical short circuit and protective device coordination analysis and calculations and arc fault calculations.

3.5.2.11. For parts including telecommunications voice/data (including SIPRNET, where applicable), include analysis for determining the number and placement of outlets

3.5.2.12. For Cathodic Protection Systems, provide the following stamped report by the licensed corrosion engineer or NACE specialist with the first design submission. The designer must be qualified to engage in the practice of corrosion control of buried or submerged metallic surfaces. He/she must be accredited or certified by the National Association of Corrosion Engineers (NACE) as a NACE Accredited Corrosion Specialist or a NACE certified Cathodic Protection Specialist, or must be a registered professional engineer with a minimum of five years experience in corrosion control and cathodic protection. Clearly describe structures, systems or components in soil or water to be protected. Describe methods proposed for protection of each.

3.5.2.13. Air Barrier System: Provide a narrative of the design and installation requirements for the Air Barrier system. As part of the design quality control process an air barrier consultant shall review drawing details to assure that details of critical Air Barrier components are properly detailed and incorporated during the design drawings and process (i.e. window flashing details, penetration in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.). Furnish the Government written review details and results.

3.5.3. Geotechnical Investigations and Reports:

3.5.3.1. The contractor's licensed geotechnical engineer shall prepare a final geotechnical evaluation report, to be submitted along with the first foundation design submittal. Make this information available as early as possible during the over-the-shoulder progress review process. Summarize the subsurface conditions and provide recommendations for the design of appropriate utilities, foundations, floor slabs, retaining walls, embankments, and pavements. Include compaction requirements for fill and backfill under buildings, sidewalks, other structures and open areas. Recommend foundation systems to be used, allowable bearing pressures for footings, lateral load

resistance capacities for foundation systems, elevations for footings, grade beams, slabs, etc. Provide an assessment of post-construction settlement potential including total and differential. Provide recommendations regarding lateral earth pressures (active, at-rest, passive) to be used in the design of retaining walls. Include the recommended spectral accelerations and Site Class for seismic design along with an evaluation of any seismic hazards and recommendations for mitigation, if required. Include calculations to support the recommendations for bearing capacity, settlement, and pavement sections. Include supporting documentation for all recommended design parameters such as Site Class, shear strength, earth pressure coefficients, friction factors, subgrade modulus, California Bearing Ratio (CBR), etc. Provide earthwork recommendations, expected frost penetration, expected groundwater levels, recommendations for dewatering and groundwater control and the possible presence of any surface or subsurface features that may affect the construction of the project such as sinkholes, boulders, shallow rock, old fill, old structures, soft areas, or unusual soil conditions. Include pH tests, salinity tests, resistivity measurements, etc., required to design corrosion control and grounding systems. Include the raw field data. Arrange a meeting with the Government subsequent to completion and evaluation of the site specific geotechnical exploration to outline any differences encountered that are inconsistent with the Government provided preliminary soils information. Clearly outline differences which require changes in the foundation type, or pavement and earthwork requirements from that possible and contemplated using the Government furnished preliminary soils investigation, which result in a change to the design or construction. Any equitable adjustment is subject to the provisions of the contract's Differing Site Conditions Clause.

3.5.3.2. Vehicle Pavements: The Contractor's geotechnical report shall contain flexible and rigid pavement designs, as applicable for the project, including design CBR and modulus of subgrade reaction and the required compaction effort for subgrades and pavement layers. Provide Information on the types of base course materials available in the area and design strengths.

3.5.3.3. The Contractor and the professional geotechnical engineer consultant shall certify in writing that the design of the project has been developed consistent with the Contractor's final geotechnical report. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the first design submission. If revisions are made to the initial design submission, a new certification shall be provided with the final design submission.

#### 3.5.4. LEED Documentation:

Assign a LEED Accredited Professional, responsible to track LEED planning, performance and documentation for each LEED credit through construction closeout. Incorporate LEED credits in the plans, specifications and design analyses. Develop LEED supporting documentation as a separable portion of the Design Analysis and provide with each required design submittal. Include the LEED Project checklist for each non-exempt facility (one checklist may be provided for multiple facilities in accordance with the LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects and the LEED SUBMITTALS (Attachment E, herein) with each submittal. Final design submittal for each portion of the work must include all required design documentation relating to that portion of work (example - all site credit design documents with final site design). Submittal requirements are as indicated in Attachment E, LEED SUBMITTALS. Submit all documentation indicated on Attachment E as due at final design at final design submittal (for fast-track projects with multiple final design submittals, this shall be at the last scheduled final design submittal). All project documentation related to LEED shall conform to USGBC requirements for both content and format, including audit requirements and be separate from other design analyses. Maintain and update the LEED documentation throughout project progress to construction closeout and shall compile product data, receipts, calculations and other data necessary to substantiate and support all credits claimed. The Government may audit any or all individual credits. Audit documentation is not required to be submitted unless requested. These requirements apply to all projects. If the project requires the Contractor to obtain USGBC certification, the Contractor shall also be responsible for obtaining USGBC certification and shall provide written evidence of certification with the construction closeout LEED documentation submittal. Install the USGBC building plaque at the location indicated by the Government upon receipt. If Contractor obtains USGBC interim design review, submit the USGBC review to the Government within 30 days of receipt for information only.

3.5.4.1. LEED Documentation for Technology Solution Set. If the Solicitation provides a Prescriptive Technology Solution Set, use of the Technology Solution set has no effect on LEED documentation requirements. Provide all required LEED documentation, including energy analysis, in accordance with LEED requirements when using the Technology Solution Set.

#### 3.5.5. Energy Conservation:

3.5.5.1. Refer to Section 01 10 00, Paragraph 5. Interim and Final Design submittals shall demonstrate that each building including the building envelope, HVAC systems, service water heating, power, and lighting systems meet the Mandatory Provisions and the Prescriptive Path requirements of ASHRAE 90.1. Use Compliance Documentation forms available from ASHRAE and included in the ASHRAE 90.1 User's Manual for this purpose. The Architectural Section of the Design Analysis shall include completed forms titled "Building Envelope Compliance Documentation Parts I and II". The Heating Ventilating and Air Conditioning (HVAC) Section of the Design Analysis shall include a completed form titled "HVAC Simplified Approach Option - Part I" if this approach is allowed by the Standard. Otherwise, the HVAC Section of the Design Analysis shall include completed forms titled "HVAC Mandatory Provisions - Part II" and "HVAC Prescriptive Requirements - Part III". The Plumbing Section of the Design Analysis shall include a completed form titled "Service Water Heating Compliance Documentation". The Electrical Section of the Design Analysis shall include an explanatory statement on how the requirements of ASHRAE 90.1 Chapter 8 Power were met. The Electrical Section of the Design Analysis shall also include a completed form titled "Lighting Compliance Documentation".

3.5.5.2. Interim and Final Design submittals which address energy consuming systems, (heating, cooling, service hot water, lighting, power, etc.) must also include calculations in a separate Energy Conservation Section of the Design Analysis which demonstrate and document (a) the baseline energy consumption for the facility or facilities under contract, that would meet the requirements of ANSI/ASHRAE/IESNA Standard 90.1 and (b) the energy consumption of the facility or facilities under contract utilizing the materials and methods required by this construction contract. Use the USGBC Energy and Atmosphere (EA) Credit 1 compliance template / form or an equivalently detailed form for documenting compliance with the energy reduction requirements. This template / form is titled PERFORMANCE RATING METHOD and is available when the project is registered for LEED. The calculation methodology used for this documentation and analysis shall follow the guidelines set forth in Appendix G of ASHRAE 90.1, with two exceptions: a) receptacle and process loads may be omitted from the calculation; and b) the definition of the terms in the formula for Percentage Improvement found in paragraph G1.2 are modified as follows: Baseline Building Performance shall mean the annual energy consumption calculated for a building design intended for use as a baseline for rating above standard design meeting the minimum requirements of the energy standard, and Proposed Building Performance shall mean annual energy consumption calculated for the proposed building design intended for construction. This calculation shall address all energy consuming systems in a single integrated methodology. Include laboratory fume hoods and kitchen ventilation loads in the energy calculation. They are not considered process loads. Individual calculations for heating, cooling, power, lighting, power, etc. systems will not be acceptable. The following building simulation software is acceptable for use in calculating building energy consumption: Hourly Analysis Program (HAP) by Carrier Corp., TRACE 700 by Trane Corp., DOE-2 by US Department of Energy, EnergyPlus by DOD/DOE.

### 3.5.6. Specifications

Specifications may be any one of the major, well known master guide specification sources (use only one source) such as MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facility Guide Specifications (UFGS using MASTERFORMAT 2004 numbering system), etc. (including specifications from these sources). Manufacturers' product specifications, utilizing CSI's Manu-Spec, three part format may be used in conjunction with the selected specifications. The designers of record shall edit and expand the appropriate Specifications to insure that all project design requirements, current code requirements, and regulatory requirements are met. Specifications shall clearly identify, where appropriate, specific products chosen to meet the contract requirements (i.e., manufacturers' brand names and model numbers or similar product information).

### 3.5.7. Building Rendering

Present and provide a draft color computer, artist, or hand drawn rendering with the conceptual design submittal of the building exterior. Perspective renderings shall include a slightly overhead view of the entire building to encompass elevations and the roof configuration of the building. After Government review and acceptance, provide a final rendering, including the following:

Three (3) 18" x 24" color prints, framed and matted behind glass with project title underneath the print.

One (1) Image file (high resolution) in JPG format on CD for those in the submittal distribution list.

### 3.5.8. Interim Building Design Contents

The following list represents what the Government considers should be included in the overall completed design for a facility or project. It is not intended to limit the contractor from providing different or additional information as needed to support the design presented, including the required design analyses discussed above. As the Contractor develops individual design packages and submits them for Interim review, include as much of the applicable information for an individual design package as is developed at the Interim design level for review purposes. These pieces shall be developed as the design progresses toward the design complete stage.

#### 3.5.8.1. Lawn and Landscaping Irrigation System

#### 3.5.8.2. Landscape, Planting and Turfing

#### 3.5.8.3. Architectural

- (a) Design Narrative
- (b) Architectural Floor Plans, Typical Wall and Roof Sections, Elevations
- (c) Finish schedule
- (d) All required equipment
- (e) Special graphics requirements
- (f) Door and Window Schedules
- (g) Hardware sets using BHMA designations
- (h) Composite floor plan showing all pre-wired workstations
- (i) Structural Interior Design (SID) package: See ATTACHMENT A for specific requirements
- (j) Furniture, Fixtures & Equipment (FF&E) design package: See ATTACHMENT B for specific requirements
- (k) Air Barrier Design: Details of all Air Barrier components, (i.e. window flashing details, penetrations in air barrier details, door flashing details, roofing/ceiling barrier interface details and etc.)

#### 3.5.8.4. Structural Systems. Include:

- (a) Drawings showing principal members for roof and floor framing plans as applicable
- (b) Foundation plan showing main foundation elements where applicable
- (c) Typical sections for roof, floor, and foundation conditions

#### 3.5.8.5. Plumbing Systems

- (a) Show locations and general arrangement of plumbing fixtures and major equipment
- (b) Plan and isometric riser diagrams of all areas including hot water, cold water, waste and vent piping. Include natural gas (and meter as required), (natural gas and meter as required), (LP gas), (fuel oil) and other specialty systems as applicable.
- (c) Include equipment and fixture connection schedules with descriptions, capacities, locations, connection sizes and other information as required

#### 3.5.8.6. HVAC Systems

- (a) Mechanical Floor Plans: The floor plans shall show all principle architectural features of the building which will affect the mechanical design. The floor plans shall also show the following:
  - (1) Room designations.
  - (2) Mechanical legend and applicable notes.
  - (3) Location and size of all ductwork and piping.
  - (4) Location and capacity of all terminal units (i.e., registers, diffusers, grilles, hydronic baseboards).
  - (5) Pre-Fabricated Paint Spray Booth (where applicable to project scope)
  - (6) Paint Preparation Area (where applicable to project scope)

- (7) Exhaust fans and specialized exhaust systems.
- (8) Thermostat location.
- (9) Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).
- (10) Location of all air handling equipment.
- (11) Air balancing information.
- (12) Flue size and location.
- (13) Piping diagram for forced hot water system (if used).
- (b) Equipment Schedule: Provide complete equipment schedules. Include:
  - (1) Capacity
  - (2) Electrical characteristics
  - (3) Efficiency (if applicable)
  - (4) Manufacturer's name
  - (5) Optional features to be provided
  - (6) Physical size
  - (7) Minimum maintenance clearances
- (a) Details: Provide construction details, sections, elevations, etc., only where required for clarification of methods and materials of design.
- (b) HVAC Controls: Submit complete HVAC controls equipment schedules, sequences of operation, wiring and logic diagrams, Input/Output Tables, equipment schedules, and all associated information. See the Statement of Work for additional specific requirements.

#### 3.5.8.7. Fire Protection and Life Safety.

- (a) Provide plan for each floor of each building that presents a compendium of the total fire protection features being incorporated into the design. Include the following types of information:
  - (1) The location and rating of any fire-resistive construction such as occupancy separations, area separations, exterior walls, shaft enclosures, corridors, stair enclosures, exit passageways, etc.
  - (2) The location and coverage of any fire detection systems
  - (3) The location and coverage of any fire suppression systems (sprinkler risers, standpipes, etc.)
  - (4) The location of any other major fire protection equipment
  - (5) Indicate any hazardous areas and their classification
  - (6) Schedule describing the internal systems with the following information: fire hazard and occupancy classifications, building construction type, GPM/square foot sprinkler density, area of operation and other as required
- (b) Working plans and all other materials submitted shall meet NFPA 13 requirements, with respect to required minimum level of detail.

#### 3.5.8.8. Elevators. Provide:

- (a) Description of the proposed control system
- (b) Description, approximate capacity and location of any special mechanical equipment for elevators.

#### 3.5.8.9. Electrical Systems.

- (a) Electrical Floor Plan(s): Show all principle architectural features of the building which will affect the electrical design. Show the following:
  - (1) Room designations.

- (2) Electrical legend and applicable notes.
- (3) Lighting fixtures, properly identified.
- (4) Switches for control of lighting.
- (5) Receptacles.
- (6) Location and designation of panelboards. Clearly indicate type of mounting required (flush or surface) and reflect accordingly in specifications.
- (7) Service entrance (conduit and main disconnect).
- (8) Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.
- (b) Building Riser Diagram(s) (from pad-mounted transformer to unit load center panelboard): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.
- (c) Load Center Panelboard Schedule(s): Indicate the following information:
  - (1) Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting).
  - (2) Branch Circuit Designations.
  - (3) Load Designations.
  - (4) Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)
  - (5) Branch Circuit Connected Loads (AMPS).
  - (6) Special Features
- (d) Lighting Fixture Schedule(s): Indicate the following information:
  - (1) Fixture Designation.
  - (2) General Fixture Description.
  - (3) Number and Type of Lamp(s).
  - (4) Type of Mounting.
  - (5) Special Features.
- (e) Details: Provide construction details, sections, elevations, etc. only where required for clarification of methods and materials of design.

3.5.8.10. Electronic Systems including the following responsibilities:

- (a) Fire Detection and Alarm System. Design shall include layout drawings for all devices and a riser diagram showing the control panel, annunciator panel, all zones, radio transmitter and interfaces to other systems (HVAC, sprinkler, etc.)
- (b) Fire Suppression System Control. Specify all components of the Fire Suppression (FS) System in the FS section of the specifications. Clearly describe how the system will operate and interact with other systems such as the fire alarm system. Include a riser diagram on the drawings showing principal components and interconnections with other systems. Include FS system components on drawing legend. Designate all components shown on floor plans "FS system components" (as opposed to "Fire Alarm components"). Show location of FS control panels, HVAC control devices, sensors, and 120V power panel connections on floor plans. Indicate zoning of areas by numbers (1, 2, 3) and detectors sub-zoned for cross zoning by letter designations (A and B). Differentiate between ceiling mounted and under floor detectors with distinct symbols and indicate sub-zone of each.
- (c) Public Address System
- (d) Special Grounding Systems. Completely reflect all design requirements in the specifications and drawings. Specifications shall require field tests (in the construction phase), witnessed by the Government, to determine the effectiveness of the grounding system. Include drawings showing existing construction, if any.
- (e) Cathodic Protection.

- (f) Intrusion Detection, Card Access System
- (g) Central Control and Monitoring System
- (h) Mass Notification System
- (i) Electrical Power Distribution Systems

3.5.8.11. Separate detailed Telecommunications drawings for Information Systems including the following responsibilities:

- (a) Telecommunications Cabling
- (b) Supporting Infrastructure
- (c) Outside Plant (OSP) Cabling - Campus or Site Plans - Exterior Pathways and Inter-Building Backbones
- (d) Include a layout of the voice/data outlets (including voice only wall & pay phones) on telecommunication floor plan drawing, location of SIPRNET data outlets (where applicable), and a legend and symbol definition to indicate height above finished floor. Show size of conduit and cable type and size on Riser Diagram. Do not show conduit runs between backboard and outlets on the floor plans. Show underground distribution conduit and cable with sizing from point of presence to entrance facility of building.
- (e) Layout of complete building per floor - Serving Zone Boundaries, Backbone Systems, and Horizontal Pathways including Serving Zones Drawings - Drop Locations and Cable ID's
- (f) Communication Equipment Rooms - Plan Views - Tech and AMEP/Elevations - Racks and Walls. Elevations with a detailed look at all telecomm rooms. Indicate technology layout (racks, ladder-racks, etc.), mechanical/electrical layout, rack elevation and backboard elevation. They may also be an enlargement of a congested area of T1 or T2 series drawing.

### 3.6. FINAL DESIGN REVIEWS AND CONFERENCES

A final design review and review conference will be held upon completion of final design at the project installation, or – where equipment is available - by video teleconference or a combination thereof, for any design package to receive Government acceptance to allow release of the design package for construction. For smaller separate design packages, the parties may agree on alternative reviews and conferences (e.g., conference calls and electronic file sharing, etc.) through the Partnering process. Include the final design conference in the project schedule and shall indicate what part of the design work is at 100% completion. The final design conference will be held after the Government has had seven (7) calendar days after receipt of the submission to review the final design package and supporting data. For smaller packages, especially those involving only one or a few design disciplines the parties may agree on a shorter period.

### 3.7. FINAL DESIGN REQUIREMENTS

Final design deliverables for a design package shall consist of 100% complete drawings, specifications, submittal register and design analyses for Government review and acceptance. The 100% design submission shall consist of drawings, specifications, updated design analyses and any permits required by the contract for each package submitted. In order to expedite the final design review, prior to the conference, ensure that the design configuration management data and all review comment resolutions are up-to-date. Include the 100% SID and 100% FF&E binders for government approval. The Contractor shall have performed independent technical reviews (ITR's) and back-checks of previous comment resolutions, as required by Section 01 45 04.00 10 CONTRACTOR QUALITY CONTROL, including providing documentation thereof. Use DrChecks or other acceptable comment tracking system during the ITR and submit the results with each final design package

#### 3.7.1. Drawings

3.7.1.1. Submit drawings complete with all contract requirements incorporated into the documents to provide a 100% design for each package submitted.

3.7.1.2. Prepare all drawings with the Computer-Aided Design and Drafting (CADD)/Computer-Aided Design (CAD) system, organized and easily referenced electronically, presenting complete construction information.

3.7.1.3. Drawings shall be complete. The Contractor is encouraged to utilize graphics, views, notes, and details which make the drawings easier to review or to construct but is also encouraged to keep such materials to those that are necessary.

3.7.1.4. Provide detail drawings that illustrate conformance with the contract. Include room finish schedules, corresponding color/finish/special items schedules, and exterior finish schedules that agree with the submitted SID binders.

3.7.1.5. The design documents shall be in compliance with the latest version of the A/E/C CAD Standard, available at <https://cadbim.usace.army.mil/CAD>. Use the approved vertical Corps of Engineers title blocks and borders on all drawings with the appropriate firm name included within the title block area.

3.7.1.6. CAD System and Building Information Modeling (BIM) (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order.)

All CAD files shall be fully compatible with MicroStation V8 or higher. Save all design CAD files as MicroStation V8 or higher files. All submitted BIM Models and associated Facility Data shall be fully compatible with Bentley BIM file format and the USACE Bentley BIM v8 Workspace.

(a) CAD Data Final File Format: During the design development capture geo-referenced coordinates of all changes made to the existing site (facility footprint, utility line installations and alterations, roads, parking areas, etc) as a result of this contract. There is no mandatory methodology for how the geo-referenced coordinates will be captured, however, Engineering and Construction Bulletin No. 2006-15, Subject: Standardizing Computer Aided Design (CAD) and Geographic Information Systems (GIS) Deliverables for all Military Design and Construction Projects identifies the format for final as-built drawings and data sets to be delivered to the government. Close-out requirements at the as-built stage; require final geo-referenced GIS Database of the new facility along with all exterior modifications. The Government will incorporate this data set into the Installation's GIS Masterplan or Enterprise GIS System. See also, Section 01 78 02.00 10 Closeout Submittals.

(b) Electronic Drawing Files: In addition to the native CAD design files, provide separate electronic drawing files (in editable CAD format and Adobe Acrobat PDF version 7.0 or higher) for each project drawing.

(c) Each file (both CAD and PDF) shall represent one complete drawing from the drawing set, including the date, submittal phase, and border. Each drawing file shall be completely independent of any data in any other file, including fonts and shapes not included with the basic CAD software program utilized. Fonts that are not included as part of the default CAD software package installation or recognized as an allowable font by the A/E/C CAD Standard are not acceptable in delivered CAD files. All displayed graphic elements on all levels of the drawing files shall be part of the project drawing image. The drawing files shall not contain any graphic element that is not part of the drawing image.

(d) Deliver BIM Model and associated Facility Data files in their native format. At a minimum, BIM files shall address major architecture design elements, major structural components, mechanical systems and electrical/communication distribution and elements as defined in Attachment F. See Attachment F for additional BIM requirements.

(e) Drawing Index: Provide an index of drawings sheet in CAD as part of the drawing set, and an electronic list in Microsoft Excel of all drawings on the CD. Include the electronic file name, the sheet reference number, the sheet number, and the sheet title, containing the data for each drawing.

(f) Hard Copies: Plot submitted hard copy drawings directly from the "electronic drawing files" and copy for quantities and sizes indicated in the distribution list at the end of this specification section. The Designers of Record shall stamp, sign and date original hard copy sheets as Released For Construction, and provide copies for distribution from this set.

### 3.7.2. Design Analyses

3.7.2.1. The designers of record shall update, finalize and present design analyses with calculations necessary to substantiate and support all design documents submitted.

3.7.2.2. The responsible DOR shall stamp, sign and date the design analysis. Identify the software used where, applicable (name, version, vendor). Generally, provide design analyses, individually, in an original (file copy) and one copy for the assigned government reviewer.



3.7.2.3. All disciplines review the LEED design analysis in conjunction with their discipline-specific design analysis; include a copy of the separable LEED design analysis in all design analysis submittals.

3.7.2.4. Do not combine multi-disciplined volumes of design-analysis, unless multiple copies are provided to facilitate multiple reviewers (one copy per each separate design analysis included in a volume).

### 3.7.3. Specifications

Specifications shall be 100% complete and in final form.

### 3.7.4. Submittal Register

Prepare and update the Submittal Register and submit it with the 100% design specifications (see Specification Section 01 33 00, SUBMITTAL PROCEDURES) with each design package. Include the required submittals for each specification section in a design package in the submittal register.

### 3.7.5. Preparation of DD Form 1354 (Transfer of Real Property)

This form itemizes the types, quantities and costs of various equipment and systems that comprise the project, for the purpose of transferring the new construction project from the Corps Construction Division to the Installation's inventory of real property. The Government will furnish the DB Contractor's design manager a DD Form 1354 checklist to use to produce a draft Form 1354. Submit the completed checklist and prepared draft Form DD 1354 with the 100% design in the Design Analysis. The Corps will use these documents to complete the final DD 1354 upon completion of construction.

### 3.7.6. Acceptance and Release for Construction

3.7.6.1. At the conclusion of the Final Design Review (after resolutions to the comments have been agreed upon between DOR and Government reviewers), the Contracting Officer or the ACO will accept the Final Design Submission for the design package in writing and allow construction to start for that design package. The Government may withhold acceptance until all major corrections have been made or if the final design submission requires so many corrections, even though minor, that it isn't considered acceptably complete.

3.7.6.2. Government review and acceptance of design submittals is for contract conformance only and shall not relieve the Contractor from responsibility to fully adhere to the requirements of the contract, including the Contractor's accepted contract proposal, or limit the Contractor's responsibility of design as prescribed under Special Contract Requirement: "Responsibility of the Contractor for Design" or limit the Government's rights under the terms of the contract. The Government reserves the right to rescind inadvertent acceptance of design submittals containing contract deviations not separately and expressly identified in the submittal for Government consideration and approval.

## 3.8. DESIGN COMPLETE CONSTRUCTION DOCUMENT REQUIREMENTS

After the Final Design Submission and Review Conference and after Government acceptance of the Final Design submission, revise the design documents for the design package to incorporate the comments generated and resolved in the final review conference, perform and document a back-check review and submit the final, design complete documents. Label the final design complete documents "FOR CONSTRUCTION" or use similar language. In addition to the final drawings and specifications, the following deliverables are required for distribution and field use. The deliverable includes all documentation and supporting design analysis in final form, as well as the final review comments, disposition and the back-check. As part of the quality assurance process, the Government may perform a back-check of the released for construction documentation. Promptly correct any errors or omissions found during the Government back-check. The Government may withhold retainage from progress payments for work or materials associated with a final design package until this submittal has been received and the Government determines that it is complete.

## 3.9. SUBMITTAL DISTRIBUTION, MEDIA AND QUANTITIES

### 3.9.1. Submittal Distribution and Quantities

General: The documents which the Contractor shall submit to the Government for each submittal are listed and generally described in preceding paragraphs in this Section. Provide copies of each design submittal and design substantiation as follows (NOTE: If this is a Single Award or Multiple Award, Indefinite Delivery/Indefinite Quantity Contract, this information will be provided for each task order):

Activity and Address	Drawing Size (Full Size) <b><u>ANSI D</u></b> Full Sets/ *Partial Sets	Design Analyses & Specs Full Sets/ *Partial Sets	Drawing Size (Half Size) <b><u>Half Size</u></b> Full Sets/ *Partial Sets	Non-BIM Data CD-ROM or DVD as Necessary (PDF & <b><u>.dgn</u></b> )	Furniture Submittal (Per Attachment B)	Structural Interior Design Submittal	BIM Data DVD (Per Attach F)
Commander, U.S.Army Engineer District <b>Charleston</b>	1/1	2/2	5/5	3	1	1	1
Commander, U.S.Army Engineer District, Center of Standardization <b>Huntsville</b>	0/0	5/0	5/0	5	N/A	1	2
Installation	0/0	0/0	0/0	0	2	0	0
U.S.Army Corps of Engineers Construction Area Office	3/3	10/10	12/12	5	1	3	3
Information Systems Engineering Command (ISEC)	0/0	0/1	0/0	1	N/A	N/A	1
Huntsville Engineer & Support Center, Central Furnishings Program	N/A	N/A	N/A	N/A	1 Interim/Refer to attachment B for the final submission Qty	N/A	N/A
Other Offices	3/3	3/3	3/3	3	N/A	1	3

**\*NOTE: For partial sets of drawings, specifications and design analyses, see paragraph 3.9.3.3, below.**

**\*\*NOTE: When specified below in 3.9.2, furnish Installation copies of Drawings as paper copies, in lieu of the option to provide secure web-based submittals.**

### 3.9.2. Web based Design Submittals

Except for full or half-sized drawings for Installation personnel, as designated in the Table above, Web based design submittals will be acceptable as an alternative to the paper copies listed in the Table above, provided a

single hard-copy PDF based record set is provided to the Contracting Officer for record purposes. Where the contract requires the Contractor to submit documents to permitting authorities, still provide those authorities paper copies (or in an alternate format where required by the authority). Web based design submittal information shall be provided with adequate security and availability to allow unlimited access those specifically authorized to Government reviewers while preventing unauthorized access or modification. File sizes must be of manageable size for reviewers to quickly download or open on their computers. As a minimum, drawings shall be full scale on American National Standards Institute (ANSI) D sheets (34" x 22"). In addition to the optional website, provide the BIM data submission on DVD to each activity and address noted above in paragraph 3.9.1 for each BIM submission required in Attachment F.

### 3.9.3. Mailing of Design Submittals

3.9.3.1. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract (or individual task order if this is an indefinite delivery/indefinite quantity, task order contract). Mail the submittals to six (6) different addresses. Assemble drawing sheets, specs, design analyses, etc. into individual sets; do not combine duplicate pages from individual sets so that the government has to assemble a set.

3.9.3.2. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

3.9.3.3. Provide partial sets of drawings, specifications, design analyses, etc., as designated in the Table in paragraph 3.9.1, to those reviewers who only need to review their applicable portions of the design, such as the various utilities. The details of which office receives what portion of the design documentation will be worked out after award.

### 3.10. AS-BUILT DOCUMENTS

Provide as-built drawings and specifications in accordance with Section 01 78 02.00 10, CLOSEOUT SUBMITTALS. Update LEED design phase documentation during construction as needed to reflect construction changes and advancing project completion status (example - Commissioning Plan updates during construction phase) and include updated LEED documentation in construction closeout submittal.

## ATTACHMENT A STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS

### 1.0 GENERAL INFORMATION

Structural Interior Design includes all building related elements and components generally part of the building itself, such as wall finishes, ceilings finishes, floor coverings, marker/bulletin boards, blinds, signage and built in casework. Develop the SID in conjunction with the furniture footprint.

### 2.0 STRUCTURAL INTERIOR DESIGN (SID) REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS

#### 2.1. FORMAT AND SCHEDULE

Prepare and submit for approval an interior and exterior building finishes scheme for an interim design submittal. The DOR shall meet with and discuss the finish schemes with the appropriate Government officials prior to preparation of the schemes to be presented. Present original sets of the schemes to reviewers at an interim design conference.

At the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers, the Contractor may proceed to final design with the interior finishes scheme presented.

The SID information and samples are to be submitted in 8 ½" x 11" format using three ring binders with pockets on the inside of the cover. When there are numerous pages with thick samples, use more than one binder. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 ½". Provide cover and spine inserts sheets identifying the document as "Structural Interior Design" package. Include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Design submittal requirements include, but are not limited to:

##### 2.1.1. Narrative of the Structural Interior Design Objectives

The SID shall include a narrative that discusses the building related finishes. Include topics that relate to base standards, life safety, sustainable design issues, aesthetics, durability and maintainability, discuss the development and features as they relate to the occupants requirements and the building design.

##### 2.1.2. Interior Color Boards

Identify and key each item on the color boards to the contract documents to provide a clear indication of how and where each item will be used. Arrange finish samples to the maximum extent possible by room type in order to illustrate room color coordination. Label all samples on the color boards with the manufacturer's name, patterns and colors name and number. Key or code samples to match key code system used on contract drawings.

Material and finish samples shall indicate true pattern, color and texture. Provide photographs or colored photocopies of materials or fabrics to show large overall patterns in conjunction with actual samples to show the actual colors. Finish samples must be large enough to show a complete pattern or design where practical.

Color boards shall include but not be limited to original color samples of the following:

All walls finishes and ceiling finishes, including corner guards, acrylic wainscoting and wall guards/chair rail finishes

All tile information, including tile grout color and tile patterns.

- All flooring finishes, including patterns.
- All door, door frame finishes and door hardware finishes
- All signage, wall base, toilet partitions, locker finishes and operable/folding partitions and trim

- All millwork materials and finishes (cabinets, counter tops, etc.)
- All window frame finishes and window treatments (sills, blinds, etc.)

Color board samples shall reflect all actual finish textures, patterns and colors required as specified. Patterned samples shall be of sufficient size to adequately show pattern and its repeat if a repeat occurs.

#### 2.1.3. Exterior Color Boards

Prepare exterior finishes color boards in similar format as the interior finishes color boards, for presentation to the reviewers during an interim design conference. Provide original color samples of all exterior finishes including but not limited to the following:

- All Roof Finishes
- All Brick and Cast Stone Samples
- All Exterior Insulation and Finish Samples
- All Glass Color Samples
- All Exterior Metals Finishes
- All Window & Door Frame Finishes
- All Specialty Item Finishes, including trim

Identify each item on the exterior finishes color boards and key to the building elevations to provide a clear indication of how and where each item will be used.

### 2.2. STRUCTURAL INTERIOR DESIGN DOCUMENTS

#### 2.2.1. General

Structural interior design related drawings must indicate the placement of extents of SID material, finishes and colors and must be sufficiently detailed to define all interior work. The following is a list of minimum requirements:

#### 2.2.2. Finish Color Schedule

Provide finish color schedule(s) in the contract documents. Provide a finish code, material type, manufacturer, series, and color designations. Key the finish code to the color board samples and drawings.

#### 2.2.3. Interior Finish Plans

Indicate wall and floor patterns and color placement, material transitions and extents of interior finishes.

#### 2.2.4. Furniture Footprint Plans

Provide furniture footprint plans showing the outline of all freestanding and systems furniture for coordination of all other disciplines.

#### 2.2.5. Interior Signage

Include interior signage plans or schedules showing location and quantities of all interior signage. Key each interior sign to a quantitative list indicating size, quantity of each type and signage text.

#### 2.2.6. Interior Elevations, Sections and Details

Indicate material, color and finish placement.

## **ATTACHMENT B FURNITURE, FIXTURES & EQUIPMENT (FF&E) REQUIREMENTS**

### **1.0 FF&E REQUIREMENTS FOR THE INTERIM AND FINAL DESIGN SUBMITTALS**

#### **1.1. FORMAT AND SCHEDULE**

Prepare and submit for approval a comprehensive FF&E scheme for an interim design submittal. The Contractor's interior designer, NOT A FURNITURE DEALER, shall develop the design. FF&E is the selection, layout, specification and documentation of furniture and includes but is not limited to workstations, seating, tables, storage and shelving, filing, trash receptacles, clocks, framed artwork, artificial plants, and other accessories. Contract documentation is required to facilitate pricing, procurement and installation. The FF&E package is based on the furniture footprint developed in the Structural Interior Design (SID) portion of the interior design. Develop the FF&E package concurrently with the building design to ensure that there is coordination between the electrical outlets, switches, J-boxes, communication outlets and connections, and lighting as appropriate. In addition, coordinate layout with other building features such as architectural elements, thermostats, location of TV's, GF/GI equipment (for example computers, printers, copiers, shredders, faxes), etc. Locate furniture in front of windows only if the top of the item falls below the window and unless otherwise noted, do not attach furniture including furniture systems to the building. If project has SIPRNET and/or NIPRNET, coordinate furniture layout with SIPRNET and NIPRNET separation requirements. Verify that access required by DOIM for SIPRNET box and conduit is provided. The DOR shall interview appropriate Government personnel to determine FF&E requirements for furniture and furnishings prior to preparation of the scheme to be presented. Determine FFE items and quantities by, but not limited to: (1) the number of personnel to occupy the building, (2) job functions and related furniture/office equipment to support the job function, (3) room functions, (4) rank and grade. Present original sets of the scheme to reviewers at an interim design conference upon completion of the interim architectural submittal or three months prior to the submittal of the final FF&E package (whichever comes first).

Design may proceed to final with the FF&E scheme presented at the conclusion of the interim phase, after resolutions to the comments have been agreed upon between DOR and Government reviewers.

Provide six copies of the electronic versions of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide unbound, electronic drawings in CAD and BIM. Provide all files needed to view complete drawings. Submit all text documents in Microsoft Word or Excel..

Submit four copies of the final and complete FF&E information and samples in 8 1/2" x 11" format using three ring binders with pockets on the inside of the cover upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first). Use more than one binder when there are numerous pages with thick samples. Large D-ring binders are preferred to O-ring binders. Use page protectors that are strong enough to keep pages from tearing out for upholstery and finish boards. Anchor large or heavy samples with mechanical fasteners, Velcro, or double-faced foam tape rather than rubber cement or glue. Fold out items must have a maximum spread of 25 1/2". Provide cover and spine inserts sheets identifying the document as "Furniture, Fixtures & Equipment" package and include the project title and location, project number, Contractor/A/E name and phone number(s), submittal stage and date.

Provide electronic copies of all documents upon completion of the final architectural submittal or ten months prior to the contract completion date (whichever comes first), to ensure adequate time for furniture acquisition. Provide six compact disks with all drawings files needed to view the complete drawings unbound and in the latest version AutoCAD. Provide six additional compact disks of all text documents in Microsoft Word or Excel.

Design submittal requirements include, but are not limited to:

##### **1.1.1. Narrative of Interior Design Objectives**

Provide a narrative description of the furniture, to include functional, safety and ergonomic considerations, durability, sustainability, aesthetics, and compatibility with the building design.

##### **1.1.2. Furniture Order Form**

Prepare one Furnishings Order Form for each item specified in the design. This form identifies all information required to order each individual item. In addition to the project name and location, project number, and submittal phase, the order form must include:

- (a) Furniture item illustration and code
- (b) Furniture item name
- (c) Job name, location, and date
- (d) General Services Administration (GSA) FSC Group, part, and section
- (e) GSA Contract Number, Special Item Number (SIN), and contract expiration date
- (f) Manufacturer, Product name and Product model number or National Stock Number (NSN)
- (g) Finish name and number (code to finish samples)
- (h) Fabric name and number, minimum Wyzenbeek Abrasion Test double rubs (code to fabric samples)
- (i) Dimensions
- (j) Item location by room number and room name
- (k) Quantity per room
- (l) Total quantity
- (m) Special instructions for procurement ordering and/or installation (if applicable)
- (n) Written Product Description: include a non-proprietary paragraph listing the salient features of the item to include but not limited to:
  - (1) required features and characteristics
  - (2) ergonomic requirements
  - (3) functional requirements
  - (4) testing requirements
  - (5) furniture style
  - (6) construction materials
  - (7) minimum warranty

The following is an example for "m" features and characteristics, ergonomic requirements and functional requirements:

Chair Description:

- (1) Mid-Back Ergonomic Task Chair
- (2) Pneumatic Gaslift; Five Star Base
- (3) Mesh Back; Upholstered Seat
- (4) Height and Width Adjustable Task Arms:
  - a. Arm Height: 6" - 11" (+-1/2")
  - b. Arm Width: 2" - 4" adjustment
- (5) Height Adjustable Lumbar Support
- (6) Adjustable Seat Height 16"-21" (+- 1")
- (7) Sliding Seat Depth Adjustment 15"-18" (+-1")
- (8) Standard Hard Casters (for carpeted areas)
- (9) Overall Measurements:
  - a. Overall width: 25" - 27"

- b. Overall depth: 25"– 28"
- (10) Must have a minimum of the following adjustments (In addition to the above):
  - a. 360 Degree Swivel
  - b. Knee-Tilt with Tilt Tension
  - c. Back angle
  - d. Forward Tilt
  - e. Forward Tilt and Upright Tilt Lock

For projects with systems furniture, also provide a written description of the following minimum requirements:

- (1) Type furniture systems (panel, stacking panels, spine wall, desk based system, or a combination)
- (2) Minimum noise reduction coefficient (NRC)
- (3) Minimum sound transfer coefficient (STC)
- (4) Minimum flame spread and smoke development
- (5) UL testing for task lighting and electrical system
- (6) Panel widths and heights and their locations (this may be done on the drawings) Worksurface types and sizes (this may be done on the drawings)
- (7) Worksurface edge type
- (8) Varying panel/cover finish materials and locations (locations may be shown on the drawings)
- (9) Storage requirements
- (10) Keyboard requirements
- (11) Lock and keying requirements
- (12) Accessory components (examples: tack boards, marker boards, paper management)
- (13) Electrical and communication raceway requirement; type, capacity and location (base, beltline, below and/or above beltline)
- (14) Locations of communication cables (base, beltline, below and/or above beltline, top channel)
- (15) Types of electrical outlets
- (16) Types of communication jacks; provided and installed by others
- (17) Locations of electrical outlets and communication jacks (this may be done on the drawings)
- (18) Type of cable (examples: Cat. 5, Cat. 6, fiber optic; UTP or STP, etc.) system needs to support; provided and installed by others

#### 1.1.3. Manufacturer & Alternate Manufacturer List

Provide a table consisting of all the major furniture items in the order forms and two alternate manufacturers for each item. ALTERNATE MANUFACTURER ITEMS MUST BE SELECTED FROM GSA SCHEDULE AND MEET ALL THE SALIENT FEATURES OF THE ORIGINALLY SPECIFIED ITEM. Provide manufacturer name, address, telephone number, product series and product name for each item and the two alternate items. Major furniture items include, but are not limited to, casegoods, furniture systems, seating, and tables. Organize matrix by item code and item name.

#### 1.1.4. FF&E Procurement List

Provide a table that lists all FF&E furniture, mission unique equipment and building Contractor Furnished/Contractor Installed (CF/CI) items. Give each item a code and name and designate whether item will be procured as part of the FF&E furniture, mission unique equipment or the building construction contract. Use the item code to key all FF&E documents including location plans, color boards, data sheets, cost estimate, etc. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.



#### 1.1.5. Points of Contact (POCs)

Provide a comprehensive list of POCs needed to implement the FF&E package. This would include but not be limited to appropriate project team members, using activity contacts, interior design representatives, construction contractors and installers involved in the project. In addition to name, address, phone, fax and email, include each contact's job function. Divide the FF&E package into different sections based on this listing, applies to order forms and cost estimates.

#### 1.1.6. Color Boards

Provide color boards for all finishes and fabrics for all FF&E items. Finishes to be included but not limited to paint, laminate, wood finish, fabric, etc.

#### 1.1.7. Itemized Furniture Cost Estimate

Provide an itemized cost estimate of furnishings keyed to the plans and specifications of products included in the package. This cost estimate should be based on GSA price schedules. The cost estimate must include separate line items for general contingency, installation, electrical hook-up for systems furniture or other furniture requiring hardwiring by a licensed electrician, freight charges and any other related costs. Installation and freight quotes from vendors should be used in lieu of a percentage allowance when available. Include a written statement that the pricing is based on GSA schedules. An estimate developed by a furniture dealership may be provided as support information for the estimate, but must be separate from the contractor provided estimate.

### 1.2. INTERIOR DESIGN DOCUMENTS

#### 1.2.1. Overall Furniture and Area Plans

Provide floor Plans showing locations and quantities of all freestanding, and workstation furniture proposed for each floor of the building. Key each room to a large scale Furniture Placement Plan showing the furniture configuration, of all furniture. Provide enlarged area plans with a key plan identifying the area in which the building is located. Key all the items on the drawings by furniture item code. Do not provide manufacturer specific information such as product names and numbers on drawings, Drawings shall be non-proprietary. This is typical for FFE on all plans, including those mentioned below.

#### 1.2.2. Workstation Plans

Show each typical workstation configuration in plan view. In addition, provide either elevations or an isometric view. Drawings shall illustrate panels and all major components for each typical workstation configuration. Identify workstations using the same numbering system as shown on the project drawings. Key components to a legend on each sheet which identifies and describes the components along with dimensions. Provide the plan, elevations and isometric of each typical workstation together on the same drawing sheet.

#### 1.2.3. Panel Plans

Show panel locations and critical dimensions from finished face of walls, columns, panels including clearances and aisle widths. Key panel assemblies to a legend which shall include width, height, configuration of frames, panel fabric and finishes (if there are different selections existing within a project), powered or non-powered panel and wall mount locations.

#### 1.2.4. Desk Plans

Provide typical free standing desk configurations in plan view. In addition, provide either elevation or an isometric view and identify components to clearly represent each desk configuration.

#### 1.2.5. Reflected Ceiling Plans

Provide typical plans showing ceiling finishes and heights, lighting fixtures, heating ventilation and air conditioning supply and return, and sprinkler head placement for coordination of furniture.

### 1.2.6. Electrical and Telecommunication Plans

Show power provisions including type and locations of feeder components, activated outlets and other electrical components. Show locations and quantities of outlets for workstations. Clearly identify different outlets, i.e. electrical, LAN and telecommunication receptacles indicating each type proposed. Show wiring configuration, (circuiting, switching, internal and external connections) and provide as applicable.

### 1.2.7. Artwork Placement Plans

Provide an Artwork Placement Plan to show location of artwork, assign an artwork item code to each piece of artwork. As an alternative, artwork can be located on the Furniture Plans. Provide a schedule that identifies each piece by room name and number. Provide installation instructions; include mounting height.

### 1.2.8. Window Drapery Plans

Provide Interior Window Drapery Plans. Key each drapery treatment to a schedule showing color, pattern, material, drapery size and type, draw direction, location and quantities.

## 1.3. FURNITURE SELECTION

1.3.1. Select furniture from the GSA Schedules. Specify furniture available open market when an item is not available on the GSA Schedules. Provide justification for items not available on the GSA Schedules.

1.3.2. To the greatest extent possible when specifying furniture work within a manufacturer's family of furniture for selections, example: Steelcase, Turnstone, Brayton International, Metro, and Vecta are all Steelcase companies. Each alternate should also be specified from a manufacturer's family of furniture, example: first set of alternates would be specified from Knoll's family of furniture and the second from Herman Miller family of furniture. It may be necessary to make some selections from other than a manufacturer's family of furniture if costs are not reasonable for particular items, some items are not available or appropriate for the facility or the items are not on GSA Schedule. If this occurs, consider specifying product from an open line that is accessible by numerous dealerships. Select office furniture including case goods, tables, storage, seating, etc. that is compatible in style, finish and color. Select furniture that complies with ANSI/BIFMA and from manufacturer's standard product line as shown in the most recent published price list and/or amendment and not custom product.

## 1.4. CONSTRUCTION

1.4.1. Provide knee space at workstations and tables that is not obstructed by panels/legs that interfere with knee space of seated person and specify modesty panels at walls to be of a height or be hinged to allow access to building wall electrical outlets and communication jacks. Provide desks, storage and tables with leveling devices to compensate for uneven floors.

1.4.2. Unless otherwise noted, specify workstations and storage of steel construction. Provide high pressure laminate worksurface tops constructed to prevent warpage (thermally fused worksurfaces are not acceptable). Provide user friendly features such as radius edges. Do not use sharp edges and exposed connections and ensure the underside of desks, tables and worksurfaces are completely and smoothly finished. Provide abutting worksurfaces that mate closely and are of equal heights when used in side-by-side configurations in order to provide a continuous and level worksurface.

1.4.3. Drawers shall stay securely closed when in the closed position and protect wires from damage during drawer operation. Include a safety catch to prevent accidental removal when fully open.

1.4.4. Unless otherwise noted, provide lockable desks and workstations, filing cabinets and storage. Key all locks within a one person office the same; key all one person offices within a building differently. If an office or open office area has more than one workstation, key all the workstations differently, but key all locks within an individual workstation the same. Use tempered glass glazing when glazing is required. Use light-emitting diode (LED)/solid state lighting where task lighting is required in furniture.

## 1.5. FINISHES AND UPHOLSTERY

1.5.1. Specify neutral colors for casegoods, furniture systems, storage and tables. Specify desk worksurfaces and table tops that are not too light or too dark in color and have a pattern to help hide soiling. Accent colors are allowed in break and lounge areas. Keep placement of furniture systems panel fabric accent colors to a minimum. All finishes shall be cleanable with ordinary household cleaning solutions.

1.5.2. Use manufacturer's standard fabrics; including textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Customers Own Material (COM) can be used in headquarter buildings in command suites with executive furniture. Coordinate specific locations with Corps of Engineers Interior Designer.

1.5.3. Specify seating upholstery that meets Wyzenbeek Abrasion Test, 55,000 minimum rubs. Specify a soil retardant finish for woven fabrics if Crypton or vinyl upholstery is not provided for seating in dining areas. Use manufacturer's standard fabrics. This includes textile manufacturers fabrics that have been graded into the furniture manufactures fabric grades and are available through their GSA Schedule. Specify upholstery and finish colors and patterns that help hide soiling. Specify finishes that can be cleaned with ordinary household cleaning solutions.

## 1.6. ACCESSORIES

1.6.1. Specify all accessories required for completely finished furniture installation. Provide filing cabinets and storage for office supplies. Provide tack surfaces at workstations with overhead storage. Provide tackable surfaces at workstations with overhead storage.

1.6.2. Not Used.

1.6.3. Workstations are to be equipped with stable keyboard trays that have height adjustability, tilting capability, including negative tilt, have a mouse pad at same height as the keyboard tray that can accommodate both left and right handed users, and retractable under worksurface.

## 1.7. MISSION UNIQUE EQUIPMENT

Funding for FF&E furniture items and mission unique equipment (MUE) items are from two different sources. Separate the designs and procurement documentation for FFE items and MUE. MUE includes, but is not limited to, items such as commercial appliances, fitness equipment, IT equipment and supporting carts. The User will purchase and install mission unique equipment items, unless otherwise noted. Identify locations of known MUE items such as commercial appliances, etc. for space planning purposes.

## 1.8. SUSTAINABILITY

1.8.1. For all designs provided regardless of facility type, make every effort to implement all aspects of sustainability to the greatest extent possible for all the selections made in the FF&E package. This includes but is not limited to the selection of products that consider: **Material Chemistry and Safety of Inputs** (What chemicals are used in the construction of the selections?); **Recyclability** (Do the selections contain recycled content?); **Disassembly** (Can the selections be disassembled at the end of their useful life to recycle their materials?).

1.8.2. Make selections to the greatest extent possible of products that possess current McDonough Braungart Design Chemistry ([MBDC](#)) certification or other "third-party" certified Cradle to Cradle program, Forest Stewardship Council (FSC) certification, GREENGAURD certification or similar "third-party" certified products consisting of low-emitting materials.

## 1.9. FURNITURE SYSTEMS

1.9.1. General.

Where appropriate, design furniture systems in open office areas. Coordinate style and color of furniture systems with other storage, seating, etc. in open office areas. Minimize the number of workstation typicals and the parts and pieces required for the design to assist in future reconfiguration and inventorying.

1.9.2. Connector Systems.

Specify a connector system that allows removal of a single panel or spine wall within a typical workstation configuration without requiring disassembly of the workstation or removal of adjacent panels. Specify connector system with tight connections and continuous visual seals. When Acoustical panels are used, provide connector system with continuous acoustical seals. Specify concealed clips, screws, and other construction elements, where possible.

#### 1.9.3. Panels and Spine Walls

Specify panels and spine walls with hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Panels shall be capable of structurally supporting more than 1 fully loaded component per panel per side. Raceways are to be an integral part of the panel and must be able to support lay-in cabling and have a large capacity for electrical and IT. Do not thread cables through the frame.

#### 1.9.4. Electrical And Information/Technology (IT)

Design furniture with electrical systems that meets requirements of UL 1286 when powered panels are required and UL approved task lights that meet requirements of NFPA 70. Dependent on user requirements and Section 01 10 00, paragraph 3 requirements, it is recommended that workstation electrical and IT wiring entry come from the building walls to eliminate the use of power poles and access at the floor. Design electrical and IT systems that are easily accessed in the spine wall and panels without having to move return panels and components. Electrical and IT management will be easily accessible by removable wall covers which can be removed while workstation components are still attached. Specify connector system that has continuation of electrical and IT wiring within workstations and workstation to workstation.

#### 1.9.5. Pedestals

Specify pedestals that are interchangeable from left to right, and right to left, and retain pedestal locking system capability.

### 1.10. EXECUTIVE FURNITURE

1.10.1. Design for executive furniture in command areas, coordinate specific locations with Corps of Engineers Interior Designer. Use upgraded furniture, upholsteries and finishes in command suites. This includes but is not limited to wood casegoods, seating and tables. Select executive furniture casegoods from a single manufacturer and style line, to include workstations, credenzas, filing, and storage, etc.

1.10.2. Specify furniture with wood veneer finish with mitered solid wood edge of same wood type. Other executive office furniture such as seating, tables, executive conference room furniture, etc. shall be compatible in style, finish and color with executive furniture casegoods.

### 1.11. SEATING

#### 1.11.1. General

Specify appropriate chair casters and glides for the floor finish where the seating is located. All task seating shall support up to a minimum of 250 lbs.

#### 1.11.2. Desk and Guest Seating

Select ergonomic desk chairs with casters, waterfall front, swivel, tilt, variable back lock, adjustable back height or adjustable lumbar support, pneumatic seat height adjustment, and padded, contoured upholstered seat and back. Desk and guest chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Depending on scale of desk chair provide seat pan forward and back adjustment to increase or decrease depth of seat pan. All desk chairs shall have an adjustable seat height range of 4 1/2", range to include 16 1/2-20". Select guest chairs that are compatible in style, finish and color with the desk chairs.

#### 1.11.3. Conference Room Seating

At tables, select ergonomic conference seating with casters, non-upholstered arms, waterfall front, swivel, tilt, pneumatic seat height adjustment, and padded, contoured seat and back, unless otherwise noted. Select arm height and/or design that allows seating to be moved up closely to the table top. Conference chair backs may be other than upholstered such as mesh fabric if it is ergonomically designed, forms to back and is comfortable. Perimeter conference chairs shall be compatible in style, finish and color with conference seating at the tables.

#### 1.11.4. Lounge, Waiting and Reception Area Seating

Select seating with arms and cushioned, upholstered seat and back. In heavy use areas, arms shall be easily cleaned such as non-upholstered arms or upholstered arms with wood arm caps unless otherwise noted.

#### 1.11.5. Break Room Seating

Select stackable seating that is easily cleaned. Seating shall be appropriate for table and counter heights as applicable with non-upholstered arms if arms are required. Chairs shall have metal legs and composite materials for seats.

#### 1.12. FILING AND STORAGE.

Select storage and shelving units that meet customer's functional load requirements for stored items. Specify counterweights for filing cabinets when required by the manufacturer for stability. File drawers shall allow only one drawer to be opened at a time. Provide heavy duty storage and shelving if information is not available.

#### 1.13. TRAINING TABLES.

Training tables shall be reconfigurable, moveable and storable; lighter weight folding with dollies or casters as necessary. Plastic laminate self edges are unacceptable. Specify power and data requirements and dollies as required.

#### 1.14. FURNITURE WARRANTIES.

Specify manufacturer's performance guarantees or warranties that include parts, labor and transportation as follows:

Furniture System, unless otherwise noted – 10 year minimum  
Furniture System Task Lights – 2 year minimum, excluding bulbs  
Furniture System Fabric – 3 year minimum  
Wood Desks - 10 year minimum

Metal Desks – 12 year minimum  
Seating, unless otherwise noted - 10 year minimum  
Seating Mechanisms and Pneumatic Cylinders - 10 years  
Seating Fabric - 3 years minimum  
Wood Filing and Storage - 10 year minimum

Tables, unless otherwise noted - 10 year minimum  
Table Mechanisms – 5 year minimum  
Table Ganging Device - 1 year minimum  
Items not listed above - 1 year minimum

## **ATTACHMENT C**

### **TRACKING COMMENTS IN DRCHECKS**

#### **1.0 General**

The Government and DB Contractor shall set up the project in Dr Checks. Throughout the design process, the parties shall enter, track, and back-check comments using the DrChecks system. Government and Contractor reviewers enter design review comments into DrChecks. Designers of Record shall annotate comments timely and specifically to indicate for the review conference exactly what action will be taken or why the action is not required. After the design review conference and prior to the next design submittal for the package, the DOR's will annotate those comments that require DOR action, design revision, etc. to show how and where it has been addressed in the design documents. This shall be part of the required design configuration management plan. Comments considered critical by the conference participants shall be flagged as such.

#### **2.0 DrChecks Review Comments**

The Contractor and the Government shall monitor DrChecks to assure all comments are annotated and resolved prior to the next submittal. Print and include the DrChecks comments and responses and included in the design analysis for record in the next design submittal for that package.

2.1. Upon review of comments prior to the design review conference, the DOR(s) shall identify whether they concur, non-concur, mark it "for information only" or mark it "check and resolve". Indicate exactly what action will be taken or why the action is not required.

2.2. Conference participants (reviewers) will expect coordination between Design Analysis calculations and the submitted design. Reviewers will also focus on the design submittal's satisfaction of the contract requirements.

2.3. After the conference, the DOR(s) shall formally respond to each applicable comment in DrChecks a second time prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Designers of Record are encouraged to directly contact reviewers to discuss and agree to the formal comment responses rather than relying only on DrChecks and review meetings to discuss comments. With the next submittal, reviewers will back-check answers to the comments against the new submittal, in addition to reviewing additional design work.

2.4. Clearly annotate in DrChecks those comments that, in the DB Contractor's opinion, require effort outside the scope of the contract. Do not proceed with work outside the contract until a modification to the contract is properly executed, if one is necessary.

#### **3.0 DrChecks Initial Account Set-Up**

To initialize an office's use of DrChecks, choose a contact person within the office to call the DrChecks Help Desk at 800-428-HELP, M-F, 8AM-5PM, Central time. This POC will be given an office password to distribute to others in the office. Individuals can then go to the hyperlink at <http://www.projnet.org> and register as a first time user. Upon registration, each user will be given a personal password to the DrChecks system.

3.1. Once the office and individuals are registered, the COE's project manager or lead reviewer will assign the individuals and/or offices to the specific project for review. At this point, persons assigned can make comments, annotate comments, and close comments, depending on their particular assignment.

#### **4.0 DrChecks Reviewer Role**

The Contractor is the technical reviewer and the Government is the compliance reviewer of the DB's design documents. Each reviewer enters their own comments into the Dr Checks system. To enter comments:

4.1. Log into DrChecks.

4.2. Click on the appropriate project.

- 4.3. Click on the appropriate review conference. An Add comment screen will appear.
- 4.4. Select or fill out the appropriate sections (particularly comment discipline and type of document for sorting) of the comment form and enter the comment in the space provided.
- 4.5. Click the Add Comment button. The comment will be added to the database and a fresh screen will appear for the next comment you have.
- 4.6. Once comments are all entered, exit DrChecks by choosing "My Account" and then Logout.

#### **5.0 DrChecks Comment Evaluation (Step 1 of 2)**

The role of the DOR(s) is to evaluate and respond to the comments entered by the Government's and DB Contractor's reviewers. To respond to comments:

- 5.1. Log into DrChecks.
- 5.2. Click on the appropriate project.
- 5.3. Under "Evaluate" click on the number under "Pending".
- 5.4. Locate the comments that require your evaluation. (Note: If you know the comment number you can use the Quick Pick window on your home page in DrChecks; enter the number and click on go.)
- 5.5. Select the appropriate evaluation radio button (concur, non-concur, for information only, or check and resolve) and respond with a brief explanation in the Discussion field. An explanation other than to say "concur" is not necessary for "Concur", but may be useful for the Design Configuration Management purposes.
- 5.6. Click on the Add button. The evaluation will be added to the database and a fresh screen will appear with the next comment.
- 5.7. Once evaluations are all entered, exit DrChecks by choosing "My Account" and then Logout.

#### **6.0 DrChecks Comment Evaluation (Step 2 of 2)**

This is where the DOR(s) respond to each applicable comment in DrChecks after the design review conference, prior to the next submittal, clearly indicating what action was taken and what drawing/spec/design analysis changed. Respond to the previous comments, following the same steps as above, adding the narrative in the discussion field.

#### **7.0 DrChecks Back-Check**

At the following design conference, (where applicable) or at some other agreed time, Government and Contractor reviewers will back-check comment annotations against newly presented documents to verify that the designers' responses are acceptable and that all revisions have been completed. Reviewers shall either enter additional back-check comments, if necessary, or close those where actions are complete.

- 7.1. Log into DrChecks.
- 7.2. Click on the appropriate project.
- 7.3. Under "My Backcheck" click on the number under "Pending".
- 7.4. If you agree with the designer's response select "Close Comment" and add a closing response if desired.
- 7.5. If you do not agree with the designer's response or the submittal does not reflect the response given, select "Issue Open", enter additional information.

7.6. Click on the Add button. The back-check will be added to the database and a fresh screen will appear with the next comment.

7.7. Once back-checks are all entered, exit DrChecks by choosing "My Account" and then Logout. The design is completed and final when there are no pending comments to be evaluated and there are no pending or open comments under back-check.



**ATTACHMENT D**  
**SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW**

Instructions: Use the information outlined in this document to provide the minimum requirement for development of Fire Protection and Life Safety Code submittals for all building projects. Additional and supplemental information may be used to further develop the code review. Insert N/A after criteria, which may be "not applicable".

**1.0 SAMPLE FIRE PROTECTION AND LIFE SAFETY CODE REVIEW**

- 1.1. Project Name (insert name and location)
- 1.2. Applicable Codes and Standards
  - 1.2.1. Unified Facilities Criteria (UFC): 3-600-01, Design: Fire Protection Engineering For Facilities
  - 1.2.2. International Building Code (IBC) for fire resistance requirements, allowable floor area, building height limitations and building separation distance requirements, except as modified by UFC 3-600-01.
  - 1.2.3. National Fire Protection Association (NFPA) 101 Life Safety Code (latest edition), for building egress and life safety and applicable criteria in UFC 3-600-01.
  - 1.2.4. ADA and ABA Accessibility Guidelines. For Buildings and Facilities See Section 01 10 00, Paragraph 3 for facility specific criteria.
- 1.3. Occupancy Classification  
IBC chapters 3 and 4
- 1.4. Construction Type  
IBC chapter 6
- 1.5. Area Limitations  
IBC chapter 5, table 503
- 1.6. Allowable Floor Areas  
IBC section 503, 505
- 1.7. Allowable area increases  
IBC section 506, 507
- 1.8. Maximum Height of Buildings  
IBC section 504
- 1.9. Fire-resistive substitution
- 1.10. Occupancy Separations  
IBC table 302.3.2
- 1.11. Fire Resistive Requirements
  - 1.11.1. Exterior Walls - [ ] hour rating, IBC table 601, 602
  - 1.11.2. Interior Bearing walls - [ ] hour rating
  - 1.11.3. Structural frame - [ ] hour rating
  - 1.11.4. Permanent partitions - [ ] hour rating

- 1.11.5. Shaft enclosures - [ ] hour rating
- 1.11.6. Floors & Floor-Ceilings - [ ] hour rating
- 1.11.7. Roofs and Roof Ceilings - [ ] hour rating
- 1.12. Automatic Sprinklers and others used to determine the need for automatic Extinguishing Equipment, Extinguishing Systems, Foam Systems, Standpipe
  - 1.12.1. UFC 3-600-01, chapters 4 and 6 systems, wet chemical systems, etc. State which systems are required and to what criteria they will be designed.
  - 1.12.2. UFC 3-600-01, Appendix B Occupancy Classification. Note the classification for each room. This may be accomplished by classifying the entire building and noting exceptions for rooms that differ (E.g. The entire building is Light Hazard except boiler room and storage rooms which are [ ], etc.)
  - 1.12.3. UFC 3-600-01, Chapter 3 Sprinkler Design Density, Sprinkler Design Area, Water Demand for Hose Streams (supply pressure and source requirements).
  - 1.12.4. UFC 3-600-01, Chapter 4 Coverage per sprinkler head. Extended coverage sprinkler heads are not permitted.
  - 1.12.5. Available Water Supply. Provide the results of the water flow tests showing the available water supply static pressure and residual pressure at flow. Based on this data and the estimated flow and pressure required for the sprinkler system, determine the need for a fire pump.
  - 1.12.6. NFPA 13, Para. 8.16.4.6.1. Provide backflow preventer valves as required by the local municipality, authority, or water purveyor. Provide a test valve located downstream of the backflow preventer for flow testing the backflow preventer at full system demand flow. Route the discharge to an appropriate location outside the building.
- 1.13. Kitchen Cooking Exhaust Equipment  
Describe when kitchen cooking exhaust equipment is provided for the project. Type of extinguishing systems for the equipment should be provided. per NFPA 96. Show all interlocks with manual release switches, fuel shutoff valves, electrical shunt trips, exhaust fans, and building alarms.
- 1.14. Portable Fire Extinguishers, fire classification and travel distance. per NFPA 10
- 1.15. Enclosure Protection and Penetration Requirements. - Opening Protectives and Through Penetrations
  - 1.15.1. IBC Section 712, 715 and Table 715.3. Mechanical rooms, exit stairways, storage rooms, janitor [ ] hour rating. IBC Table 302.1.1
  - 1.15.2. Fire Blocks, Draft Stops, Through Penetrations and Opening Protectives
- 1.16. Fire Dampers. Describe where fire dampers and smoke dampers are to be used (IBC Section 716 and NFPA 90A). State whether isolation smoke dampers are required at the air handler.
- 1.17. Detection Alarm and Communication. UFC 3-600-01, (Chapter 5); NFPA 101 para. 3.4 (chapters 12-42); NFPA 72
- 1.18. Mass Notification. Describe building/facility mass notification system (UFC 4-021-01) type and type of base-wide mass notification/communication system. State whether the visible notification appliances will be combined with the fire alarm system or kept separate. (Note: Navy has taken position to combine visible notification appliances with fire alarm).
- 1.19. Interior Finishes (classification). NFPA 101.10.2.3 and NFPA 101.7.1.4
- 1.20. Means of Egress

- 1.20.1. Separation of Means of Egress, NFPA 101 chapters 7 and 12-42; NFPA101.7.1.3
- 1.20.2. Occupant Load, NFPA101.7.3.1 and chapters 12-42.
- 1.20.3. Egress Capacity (stairs, corridors, ramps and doors) NFPA101.7.3.3
- 1.20.4. Number of Means of Egress, NFPA101.7.4 and chapters 12-42.
- 1.20.5. Dead end limits and Common Path of Travel, NFPA 101.7.5.1.6 and chapters 12-42.
- 1.20.6. Accessible Means of Egress (for accessible buildings), NFPA101.7.5.4
- 1.20.7. Measurement of Travel Distance to Exits, NFPA101.7.6 and chapters 12-42.
- 1.20.8. Discharge from Exits, NFPA101.7.7.2
- 1.20.9. Illumination of Means of Egress, NFPA101.7.8
- 1.20.10. Emergency Lighting, NFPA101.7.9
- 1.20.11. Marking of Means of Egress, NFPA101.7.10
- 1.21. Elevators, UFC 3-600-01, Chapter 6; IBC and ASME A17.1 - 2000,(Safety Code for Elevators and Escalators)
- 1.22. Accessibility Requirements, ADA and ABA Accessibility Guidelines for Buildings and Facilities
- 1.23. Certification of Fire Protection and Life Safety Code Requirements. (Note: Edit the Fire team membership if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features for this project in accordance with the attached completed form(s).
- 1.24. Designer of Record. Certification of Fire protection and Life Safety Code Requirements. (Note: Edit the Fire team members if necessary). Preparers of this document certify the accuracy and completeness of the Fire Protection and Life Safety features of this project.

Fire Protection Engineer of Record:

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Signature and Stamp

Date

OR

Architect of Record:

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Signature and Stamp

Date

Mechanical Engineer of Record:

---

Signature and Stamp

Date

Electrical Engineer of Record:

Friday, May 27, 2011

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Signature/Date

**ATTACHMENT E**  
**LEED SUBMITTALS**

LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)	Provide for Credit Audit Only	REQUIRED DOCUMENTATION	Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
PAR		FEATURE	DUE AT		DATE	REV
<b>GENERAL</b>						
		GENERAL - All calculations shall be in accordance with LEED 2009 Reference Guide.				
		GENERAL: Obtain excel version of this spreadsheet at <a href="http://en.sas.usace.army.mil/enWeb/EngineeringCriteria">http://en.sas.usace.army.mil/enWeb/EngineeringCriteria</a> .				
		GENERAL - For all credits, narrative/comments may be added to describe special circumstances or considerations regarding the project's credit approach.				
		GENERAL - Include all required LEED drawings indicated below in contract drawings with applicable discipline drawings, labeled For Reference Only.				
		NOTE: Each submittal indicated with "****" differs from LEED certified project submittals by either having a different due date or being an added submittal not required by GBCI.				
		NOTE: Projects seeking LEED certification need only submit to GBCI whatever documentation is acceptable to GBCI (for example, licensed professional certifications). This checklist identifies what must be submitted to the Government for internal review purposes. Government review of LEED documentation in no way supercedes or modifies the requirements and rulings of GBCI for purposes of compliance with project requirement to obtain LEED certification.				
		GENERAL - Audit documentation may include but is not limited to what is indicated in this table.				
			Closeout	List of all Final Design submittals revised after final design to reflect actual closeout conditions. Revised Final Design submittals. - OR - Statement confirming that no changes have been made since final design that effect final design submittal documents.		Proj Engr (PE)
<b>CATEGORY 1 - SUSTAINABLE SITES</b>						
SSPR1		Construction Activity Pollution Prevention (PREREQUISITE)	**Final Design	List of drawings and specifications that address the erosion control, particulate/dust control and sedimentation control measures to be implemented.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			**Final Design	Narrative that indicates which compliance path was used (NPDES or Local standards) and describes the measures to be implemented on the project. If a local standard was followed, provide specific information to demonstrate that the local standard is equal to or more stringent than the NPDES program.		CIV
SS1		Site Selection	Final Design	Statement confirming that project does not meet any of the prohibited criteria.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	LEED Site plan drawing that shows all proposed development, line depicting boundary of all bodies of water and/or wetlands within 100 feet of project boundary and a line depicting 5' elevation above 100 year flood line that falls within project boundary. Not required if neither condition applies.		CIV
SS2		Development Density & Community Connectivity	Final Design	Option 1: LEED Site vicinity plan showing project site and surrounding development. Show density boundary or note drawing scale.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	Option 1: Table indicating, for project site and all surrounding sites within density radius (keyed to site vicinity plan), site area and building area. Project development density calculation. Density radius calculation. Development density calculation within density radius.		CIV
			Final Design	Option 2: LEED Site vicinity plan showing project site, the 1/2 mile community radius, pedestrian walkways and the locations of the residential development(s) and Basic Services surrounding the project site.		CIV
			Final Design	Option 2: List (including business name and type) of all Basic Services facilities within the 1/2 mile radius, keyed to site vicinity plan.		CIV
SS3		Brownfield Redevelopment	Final Design	Narrative describing contamination and the remediation activities included in project. Include statement indicating how site was determined to be a brownfield.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS4.1		Alternative Transportation: Public Transportation Access	Final Design	Statement indicating which option for compliance applies. State whether public transportation is existing or proposed and, if proposed, cite source of this information.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	Option 1: LEED Site vicinity plan showing project site, mass transit stops and pedestrian path to them with path distance noted.		CIV
			Final Design	Option 2: LEED Site vicinity plan showing project site, bus stops and pedestrian path to them with path distance noted.		CIV
SS4.2		Alternative Transportation: Bicycle Storage & Changing Rooms	Final Design	FTE calculation. Bicycle storage spaces calculation. Shower/changing facilities calculation.		CIV
			Final Design	List of drawings that show the location(s) of bicycle storage areas. Statement indicating distance from building entrance.		CIV
			Final Design	List of drawings that show the location(s) of shower/changing facilities and, if located outside the building, statement indicating distance from building entrance.		CIV

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SS4.3		Alternative Transportation: Low Emitting & Fuel Efficient Vehicles	Final Design	Statement indicating which option for compliance applies. FTE calculation. Statement indicating total parking capacity of site.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	Option 1: Low-emission & fuel-efficient vehicle calculation.		CIV
			Final Design	Option 1: List of drawings and specification references that show location and number of preferred parking spaces for low-emission & fuel-efficient vehicles and signage.		CIV
			Final Design	Option 1: Statement indicating quantity, make, model and manufacturer of low-emission & fuel-efficient vehicles to be provided. Statement confirming vehicles are zero-emission or indicating ACEEE vehicle scores.		CIV
			Final Design	Option 2: Low-emission & fuel-efficient vehicle parking calculation.		CIV
			Final Design	Option 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design	Option 3: Low-emission & fuel-efficient vehicle refueling station calculation.		CIV
			Final Design	Option 3: List of drawings and specifications indicating location and number of refueling stations, fuel type and fueling capacity for each station for an 8-hour period.		CIV
			Closeout	X Option 3: Construction product submittals indicating what was provided and confirming compliance with respect to fuel type and fueling capacity for each station for an 8-hour period.		CIV
SS4.4		Alternative Transportation: Parking Capacity	Final Design	Statement indicating which option for compliance applies.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	Option 1: Preferred parking calculation including number of spaces required, total provided, preferred spaces provided and percentage.		CIV
			Final Design	Option 2: FTE calculation. Preferred parking calculation including number of spaces provided, preferred spaces provided and percentage.		CIV
			Final Design	Options 1 and 2: List of drawings and specification references that show location and number of preferred parking spaces and signage.		CIV
			Final Design	Option 3: Narrative indicating number of spaces required and provided and describing infrastructure and support programs with description of project features to support them.		CIV
SS5.1		Site Development: Protect or Restore Habitat	**Final Design	Option 1: List of drawing and specification references that convey site disturbance limits.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			**Final Design	Option 2: LEED site plan drawing that delineates boundaries of each preserved and restored habitat area with area (sf) noted for each.		CIV
			**Final Design	Option 2: Percentage calculation of restored/preserved habitat to total site area. List of drawings and specification references that convey restoration planting requirements.		CIV
SS5.2		Site Development: Maximize Open Space	Final Design	Option 2: LEED site plan drawing delineating boundary of vegetated open space adjacent to building with areas of building footprint and designated open space noted.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS6.1		Stormwater Design: Quantity Control	Final Design	Statement indicating which option for compliance applies.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	Option 1: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf) -OR - Narrative describing site conditions, measures and controls to be implemented to prevent excessive stream velocities and erosion.		CIV
			Final Design	Option 2: Indicate pre-development and post-development runoff rate(cfs) and runoff quantity (cf). Indicate percent reduction in each.		CIV
SS6.2		Stormwater Design: Quality Control	Final Design	For non-structural controls, list all BMPs used and, for each, describe the function of the BMP and indicate the percent annual rainfall treated. List all structural controls and, for each, describe the pollutant removal and indicate the percent annual rainfall treated.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
SS7.1		Heat Island Effect: Non-Roof	**Final Design	LEED site plan drawing indicating locations and quantities of each paving type, including areas of shaded pavement. Percentage calculation indicating percentage of reflective/shaded/open grid area.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV

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SS7.2		Heat Island Effect: Roof	Final Design	Option 1: Percentage calculation indicating percentage of SRI compliant roof area. List of drawings and specification references that convey SRI requirements and roof slopes.		ARC
			Final Design	Option 1: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**Closeout	Option 1: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope.		PE
			Closeout	X Option 1: Manufacturer published product data or certification confirming SRI		PE
			Final Design	Option 2: Percentage calculation indicating percentage of vegetated roof area.		ARC
			Final Design	Option 3: Combined reflective and green roof calculation.		ARC
			Final Design	Option 3: List of specified roof materials indicating, for each, type, manufacturer, product name and identification if known, SRI value and roof slope.		ARC
			**Closeout	Option 3: List of installed roof materials indicating, for each, manufacturer, product name and identification, SRI value and roof slope.		PE
			Closeout	X Option 3: Manufacturer published product data or certification confirming SRI		PE
SS8		Light Pollution Reduction	Final Design	Interior Lighting: List of drawings and specification references that convey interior lighting requirements (location and type of all installed interior lighting, location of non-opaque exterior envelope surfaces, allowing confirmation that maximum candela value from interior fixtures does not intersect non-opaque building envelope surfaces). - OR - List of drawings and specification references that show automatic lighting controls compliance with credit requirement.		ELEC
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		ELEC
			Final Design	Exterior Lighting: List of drawings and specification references that convey exterior lighting requirements (location and type of all site lighting and building façade/landscape lighting).		ELEC
			Final Design	Exterior Site Lighting Power Density (LPD): Tabulation for exterior site lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all site lighting.		ELEC
			Final Design	Exterior Building Facade/Landscape Lighting Power Density (LPD): Tabulation for exterior building facade/landscape lighting indicating, for each location identification or description, units of measure, area or distance of the location, actual LPD using units consistent with ASHRAE 90.1, and the ASHRAE allowable LPD for that type of location. Percentage calculation of actual versus allowable LPD for all building facade/landscape lighting.		ELEC
			Final Design	Exterior Lighting IESNA Zone: Indicate which IESNA zone is applicable to the project.		ELEC
			Final Design	Exterior Lighting Site Lumen table indicating, for each fixture type, quantity installed, initial lamp lumens per luminaire, initial lamp lumens above 90 degrees from Nadir, total lamp lumens and total lamp lumens above 90 degrees. Percentage of site lamp lumens above 90 degrees from nadir to total lamp lumens.		ELEC
			Final Design	Exterior Lighting Narrative describing analysis used for addressing requirements for light trespass at site boundary and beyond.		ELEC
<b>CATEGORY 2 – WATER EFFICIENCY</b>						
WEPR1		Water Use Reduction: 20% Reduction	Final Design	Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design	Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
			Final Design	Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation.		MEC

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			Final Design	Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design	Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Closeout	X Manufacturer published product data or certification confirming fixture water usage.		PE
WE1.1		Water Efficient Landscaping: Reduce by 50%	Final Design	Statement indicating which option for compliance applies.		CIV
			**Final Design	Delineation and labeling of "LEED Project site boundary" on site plan.		CIV
			Final Design	Calculation indicating, for baseline and design case, total water applied, total potable water applied, total non-potable water applied. Design case percent potable water reduction. If nonpotable water is used, indicate source of nonpotable water.		CIV
			Final Design	List of landscape plan drawings.		CIV
			Final Design	Narrative describing landscaping and irrigation design strategies, including water use calculation methodology used to determine savings and, if non-potable water is used, specific information about source and available quantity.		CIV
WE1.2		Water Efficient Landscaping: No Potable Water Use or No Irrigation	Same as WE1.1	Same as WE1.1		CIV
WE2		Innovative Wastewater Technologies	Final Design	Statement confirming which option for compliance applies.		MEC
			Final Design	Statement confirming which occupancy breakdown applies (default or special). For special occupancy breakdown, indicate source and explanation for ratio.		MEC
			Final Design	Occupancy calculation including male/female numbers for FTEs, visitors, students, customers, residential and other type occupants/users		MEC
			Final Design	Statement indicating percent of male restrooms with urinals. Statement indicating annual days of operation.		MEC
			Final Design	Baseline flush fixture calculation spreadsheet indicating, for each fixture type, gender, flush rate, daily uses per person for each occupant type identified in occupancy calculation and annual baseline flush fixture water usage.		MEC
			Final Design	Design case flush fixture calculation spreadsheet indicating, for each fixture type, gender, fixture manufacturer, fixture model number, flush rate, percent of occupants using this fixture type, daily uses per person for each occupant type identified in occupancy calculation and annual design case flush fixture water usage.		MEC
			Final Design	Option 1: If onsite non-potable water is used, identify source(s), indicate annual quantity from each source and indicate total annual quantity from all onsite non-potable water sources.		MEC
			Final Design	Option 1: Summary calculation indicating baseline annual water consumption, design case annual water consumption, non-potable annual water consumption and total percentage annual water savings.		MEC
			Final Design	Option 2: Statement confirming on-site treatment of all generated wastewater to tertiary standards and all treated wastewater is either infiltrated or used on-site.		MEC
			Final Design	Option 2: List of drawing and specification references that convey design of on-site wastewater treatment features.		CIV
			Final Design	Option 2: On-site water treatment quantity calculation indicating all on-site wastewater source(s), annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from each source and totals for annual quantity treated, annual quantity infiltrated and annual quantity re-used on site from all sources.		CIV
			Final Design	Option 2: Wastewater summary calculation indicating design case annual flush fixture water usage, annual on-site water treatment and percentage sewage conveyance reduction.		MEC
			Final Design	Narrative describing project strategy for reduction of potable water use for sewage conveyance, including specific information on reclaimed water usage and treated wastewater usage.		MEC
WE3		Water Use Reduction: 30% - 40% Reduction	Same as WEPR1	Same as WEPR1		MEC

## CATEGORY 3 – ENERGY AND ATMOSPHERE

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EAPR1		Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	**Final Design	**Owner's Project Requirements document		ALL
			**Final Design	**Basis of Design document for commissioned systems		MEC, ELEC
			**Final Design	**Commissioning Plan		MEC, ELEC
			Closeout	Statement confirming all commissioning requirements have been incorporated into construction documents.		PE
			Closeout	Commissioning Report		PE
EAPR2		Minimum Energy Performance (PREREQUISITE)	Final Design	Statement listing the mandatory provisions of ASHRAE 90.1 that project meets relative to compliance with this prerequisite and indicating which compliance path was used.		MEC ELEC ARC
			Final Design	Statement indicating which compliance path option applies.		MEC
			Final Design	Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology.		MEC
			Final Design	Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score.		MEC
			Final Design	Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC
			Final Design	Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC
			Final Design	Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type		MEC
			Final Design	Option 1: Energy type summary listing, for each energy type, utility rate description, units of energy and units of demand		MEC
			Final Design	Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design	Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design	Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design	Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
			Final Design	Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design	Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC
			Final Design	Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design	Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

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			Final Design	Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features		MEC
			Final Design	Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates)		MEC
EAPR3		Fundamental Refrigerant Management (PREREQUISITE)	Final Design	Statement indicating which option for compliance applies.		MEC
			Final Design	Option 2: Narrative describing phase out plan, including specific information on phase out dates and refrigerant quantities.		MEC
EA1		Optimize Energy Performance	Final Design	Statement indicating which compliance path option applies.		MEC
			Final Design	Option 1: Statement confirming simulation software capabilities and confirming assumptions and methodology.		MEC
			Final Design	Option 1: General information including simulation program, principal heating source, percent new construction and renovation, weather file, climate zone and Energy Star Target Finder score.		MEC
			Final Design	Option 1: Space summary listing, for each building use, the conditioned area, unconditioned area and total area and include total area for each category		MEC
			Final Design	Option 1: List of all simulation output advisory message data and show difference between baseline and proposed design		MEC
			Final Design	Option 1: Comparison summary for energy model inputs including description of baseline and design case energy model inputs, showing both by element type		MEC
			Final Design	Option 1: Energy type summary listing, for each energy type, utility rate description, units of energy and units of demand		MEC
			Final Design	Option 1: Statement indicating whether project uses on-site renewable energy. If yes, list all sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost		MEC
			Final Design	Option 1: If analysis includes exceptional calculation methods, statement describing how exceptional calculation measure cost savings is determined		MEC
			Final Design	Option 1: If analysis includes exceptional calculation methods, for each exceptional calculation method indicate energy types and, for each energy type, annual energy savings, annual cost savings, and brief descriptive narrative		MEC
			Final Design	Option 1: Baseline performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand for all four orientations. For each orientation indicate total annual energy use for each orientation and total annual process energy use.		MEC
			Final Design	Option 1: Baseline energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design	Option 1: Proposed Design performance rating compliance report table indicating, for each energy end use, whether it is a process load, energy type, annual and peak energy demand, baseline annual and peak energy demand and percent savings. Indicate total annual energy use and total annual process energy use for both proposed design and baseline and percent savings.		MEC
			Final Design	Option 1: Proposed Design energy cost table indicating, for each energy type, annual cost for all four orientations and building total energy cost.		MEC
			Final Design	Option 1: Energy cost and consumption by energy type report indicating, for each energy type, proposed design and baseline annual use and annual cost, percent savings annual use and annual cost. Indicate for renewable energy annual energy generated and annual cost. Indicate exceptional calculations annual energy savings and annual cost savings. Indicate building total annual energy use, annual energy cost for proposed design and baseline and indicate percent savings annual energy use and annual energy cost.		MEC

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			Final Design	Option 1: Compliance summaries from energy simulation software. If software does not produce compliance summaries provide output summaries and example input summaries for baseline and proposed design supporting data in the tables. Output summaries must include simulated energy consumption by end use and total energy use and cost by energy type. Example input summaries should represent most common systems and must include occupancy, use pattern, assumed envelope component sizes and descriptive features and assumed mechanical equipment types and descriptive features	MEC
			Final Design	Option 1: Energy rate tariff from project energy providers (only if not using LEED Reference Guide default rates)	MEC
EA2.1		On-Site Renewable Energy	Final Design	Statement indicating which compliance path option applies.	ELEC
			Final Design	List all on-site renewable energy sources and indicate, for each source, backup energy type, annual energy generated, rated capacity and renewable energy cost. Indicate total annual energy use (all sources), total annual energy cost (all sources) and percent renewable energy cost.	ELEC MEC
			Final Design	Option 1: Indicate, for renewable energy, proposed design total annual energy generated and annual cost.	ELEC MEC
			Final Design	Option 2: Indicate CBECS building type and building gross area. Provide the following CBECS data: median annual electrical intensity, median annual non-electrical fuel intensity, average electric energy cost, average non-electric fuel cost, annual electric energy use and cost, annual non-electric fuel use and cost.	ELEC MEC
			Final Design	Option 2: Narrative describing renewable systems and explaining calculation method used to estimate annual energy generated, including factors influencing performance.	ELEC MEC
EA2.2		On-Site Renewable Energy	Same as EA2.1	Same as EA2.1	ELEC MEC
EA2.3		On-Site Renewable Energy	Same as EA2.1	Same as EA2.1	ELEC MEC
EA3		Enhanced Commissioning	**Final Design	**Owner's Project Requirements document (OPR)	ALL
			**Final Design	**Basis of Design document for commissioned systems (BOD)	ELEC MEC
			**Final Design	**Commissioning Plan	ELEC MEC
			Closeout	Statement confirming all commissioning requirements have been incorporated into construction documents.	PE
			Closeout	**Commissioning Report	PE
			**Final Design	Statement by CxA confirming Commissioning Design Review	
			Closeout	Statement by CxA confirming review of Contractor submittals for compliance with OPR and BOD	PE
			Closeout	**Systems Manual	PE
			Closeout	Statement by CxA confirming completion of O&M staff and occupant training	PE
			Closeout	**Scope of work for post-occupancy review of building operation, including plan for resolution of outstanding issues	PE
			**Predesign	Statement confirming CxA qualifications and contractual relationships relative to work on this project, demonstrating that CxA is an independent third party.	MEC
EA4		Enhanced Refrigerant Management	Final Design	Refrigerant impact calculation table with all building data and calculation values as shown in LEED 2009 Reference Guide Example Calculations	MEC
			Final Design	Narrative describing any special circumstances or explanatory remarks	
			Closeout	X Cut sheets highlighting refrigerant data for all HVAC components.	PE
EA5		Measurement & Verification	Closeout	Statement indicating which compliance path option applies.	PE
			Closeout	Measurement and Verification Plan including Corrective Action Plan	PE
			Closeout	**Scope of work for post-occupancy implementation of M&V plan including corrective action plan.	PE
EA6		Green Power	Closeout	Statement indicating which compliance path option applies.	PE
			Closeout	Option 1: Indicate proposed design total annual electric energy usage	PE
			Closeout	Option 2: Indicate actual total annual electric energy usage	PE
			Closeout	Option 3: Calculation indicating building type, total gross area, median electrical intensity and annual electric energy use	PE

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			Closeout	Green power provider summary table indicating, for each purchase type, provider name, annual quantity green power purchased and contract term. Indicate total annual green power use and indicate percent green power		PE
			Closeout	Narrative describing how Green Power or Green Tags are purchased		PE
<b>CATEGORY 4 – MATERIALS AND RESOURCES</b>						
MRPR1		Storage & Collection of Recyclables (PREREQUISITE)	Final Design	Statement confirming that recycling area will accommodate recycling of plastic, metal, paper, cardboard and glass. Narrative indicating any other materials addressed and coordination with pickup.		ARC
MR1.1		Building Reuse: Maintain 55% of Existing Walls, Floors & Roof	**Final Design	If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design	Spreadsheet listing, for each building structural/envelope element, the existing area and reused area. Total percent reused.		ARC
MR1.2		Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	Same as MR1.1	Same as MR1.1		ARC
MR1.3		Building Reuse: Maintain 95% of Existing Walls, Floors & Roof	Same as MR1.1	Same as MR1.1		ARC
MR1.4		Building Reuse: Maintain 50% of Interior Non-Structural Elements	**Final Design	If project includes a building addition, confirm that area of building addition does not exceed 2x the area of the existing building.		ARC
			**Final Design	Spreadsheet listing, for each building interior non-structural element, the existing area and reused area. Total percent reused.		ARC
MR2.1		Construction Waste Management: Divert 50% From Disposal	**Preconstruction	Waste Management Plan		PE
			**Construction Quarterly and Closeout	Spreadsheet calculations indicating material description, disposal/diversion location (or recycling hauler), weight, total waste generated, total waste diverted, diversion percentage		PE
			**Construction Quarterly and Closeout	Receipts/tickets for all items on spreadsheet		PE
MR2.2		Construction Waste Management: Divert 75% From Disposal	Same as MR2.1	Same as MR2.1		PE
MR3.1		Materials Reuse: 5%	Closeout	Statement indicating total materials value and whether default or actual.		PE
			Closeout	Spreadsheet calculations indicating, for each reused/salvaged material, material description, source or vendor, cost. Total reused/salvaged materials percentage.		PE
MR3.2		Materials Reuse: 10%	Same as MR3.1	Same as MR3.1		PE
MR4.1		Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Closeout	Statement indicating total materials value and whether default or actual.		PE
			Closeout	Spreadsheet calculations indicating, for each recycled content material, material name/description, manufacturer, cost, post-consumer recycled content percent, pre-consumer recycled content percent, source of recycled content data. Total post-consumer content materials cost, total pre-consumer content materials cost, total combined recycled content materials cost, recycled content materials percentage.		PE
			Final Design or NLT Preconstruction	**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	Manufacturer published product data or certification, confirming recycled content percentages in spreadsheet		PE
MR4.2		Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Same as MR4.1	Same as MR4.1		PE
MR5.1		Regional Materials: 10% Extracted, Processed & Manufactured Regionally	Closeout	Statement indicating total materials value and whether default or actual.		PE
			Closeout	Spreadsheet calculations indicating, for each regional material, material name/description, manufacturer, cost, percent compliant, harvest distance, manufacture distance, source of manufacture and harvest location data. Total regional materials cost, regional materials percentage.		PE
			Preconstruction	**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.		PE
			Closeout	Manufacturer published product data or certification confirming regional material percentages in spreadsheet		PE

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MR5.2		Regional Materials:20% Extracted, Processed & Manufactured Regionally	Same as MR5.1	Same as MR5.1	PE
MR6		Rapidly Renewable Materials	Closeout	Statement indicating total materials value and whether default or actual.	PE
			Closeout	Spreadsheet calculations indicating, for each rapidly renewable material, material name/description, manufacturer, cost, rapidly renewable content percent, rapidly renewable product value. Total rapidly renewable product value, rapidly renewable materials percentage.	PE
			Final Design	**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.	ARC
			Closeout	X Manufacturer published product data or certification confirming rapidly renewable material percentages in spreadsheet	PE
MR7		Certified Wood	Closeout	Statement indicating total materials value and whether default or actual.	PE
			Closeout	Spreadsheet calculations indicating, for each certified wood material, material name/description, vendor, cost, wood component percent, certified wood percent of wood component, FSC chain of custody certificate number. Total certified wood product value, certified wood materials percentage.	PE
			Final Design or NLT Preconstruction	**Purchasing Plan consisting of spreadsheet indicated above, filled in with estimated quantities to show strategy for achieving goal.	PE
			Closeout	X Vendor invoices, FSC chain of custody certificates and manufacturer published product data or certification confirming all certified wood materials percentages in spreadsheet.	PE
<b>INDOOR ENVIRONMENTAL QUALITY</b>					
EQPR1		Minimum IAQ Performance (PREREQUISITE)	Final Design	Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements.	MEC
			Final Design	Narrative describing the project's ventilation design, including specifics about fresh air intake volumes and special considerations.	MEC
EQPR2		Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Final Design	Statement indicating which option for compliance applies, stating applicable criteria/requirement, and confirming that project has been designed to meet the applicable requirements.	ARC
			Final Design	List of drawing and specification references that convey conformance to applicable requirements (signage, exhaust system, room separation details, etc).	ARC
EQ1		Outdoor Air Delivery Monitoring	Final Design	Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.	MEC
			Final Design	List of drawing and specification references that convey conformance to applicable requirements.	MEC
			Final Design	Narrative describing the project's ventilation design and CO2 monitoring system, including specifics about monitors, operational parameters and setpoints.	MEC
			Closeout	X Cut sheets for CO2 monitoring system.	PE
EQ2		Increased Ventilation	Final Design	Statement indicating which option for compliance applies and confirming that project has been designed to meet the applicable requirements.	MEC
			Final Design	Narrative describing the project's ventilation design, including specifics about zone fresh air intake volumes and demonstrating compliance.	MEC
			Final Design	Option 2: Narrative describing design method used for determining natural ventilation design, including calculation methodology/model results and demonstrating compliance.	MEC
			Final Design	List of drawing and specification references that convey conformance to applicable requirements.	MEC
EQ3.1		Construction IAQ Management Plan: During Construction	**Preconstruction	Construction IAQ Management Plan	PE
			Closeout	Statement confirming whether air handling units were operated during construction	PE
			Closeout	Dated jobsite photos showing examples of IAQ management plan practices being implemented. Label photos to indicate which practice they demonstrate. Minimum one photo of each practice at each building.	PE

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LEED Credit Paragraph	Contractor Check Here if Credit is Claimed	LEED-NC v3 Submittals (OCT09)	Provide for Credit Audit Only		Date Submitted (to be filled in by Contractor)	Government Reviewer's Use
PAR		FEATURE	DUE AT	REQUIRED DOCUMENTATION	DATE	REV
			Closeout	Spreadsheet indicating, for each filter installed during construction, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy.		PE
EQ3.2		Construction IAQ Management Plan: Before Occupancy	**Preconstruction	Construction IAQ Management Plan		PE
			Closeout	Statement indicating which option for compliance applies and confirming that required activities have occurred that meet the applicable requirements.		PE
			Closeout	Option 1a: Narrative describing the project's flushout process, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE
			Closeout	Option 1b: Narrative describing the project's pre-occupancy and post-occupancy flushout processes, including specifics about temperature, airflow and duration, special considerations (if any) and demonstrating compliance.		PE
			Closeout	Option 2: Narrative describing the project's IAQ testing process, including specifics about contaminants tested for, locations, remaining work at time of test, retest parameters and special considerations (if any).		PE
			Closeout	Option 2: IAQ testing report demonstrating compliance.		PE
EQ4.1		Low Emitting Materials: Adhesives & Sealants	Closeout	Spreadsheet indicating, for each applicable indoor adhesive, sealant and sealant primer used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE
			Closeout	Spreadsheet indicating, for each applicable indoor aerosol adhesive, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor aerosol adhesives were used for the project.		PE
			Closeout	Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE
EQ4.2		Low Emitting Materials: Paints & Coatings	Closeout	Spreadsheet indicating, for each applicable indoor paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data.		PE
			Closeout	Spreadsheet indicating, for each applicable indoor anti-corrosive/anti-rust paint and coating used, the manufacturer, product name/model number, VOC content, LEED VOC limit, and source of VOC data - OR - Statement confirming no indoor anti-corrosive/anti-rust paints were used for the project.		PE
			Closeout	Manufacturer published product data or certification confirming material VOCs in spreadsheet		PE
EQ4.3		Low Emitting Materials: Flooring Systems	Closeout	Spreadsheet indicating, for each indoor flooring system used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data.		PE
			Closeout	Spreadsheet indicating, for each indoor carpet cushion used, the manufacturer, product name/model number, if it meets LEED requirement (yes/no) and source of LEED compliance data - OR - Statement confirming no indoor carpet cushion was used for the project.		PE
			Closeout	Manufacturer published product data or certification confirming material compliance label in spreadsheet		PE
EQ4.4		Low Emitting Materials: Composite Wood & Agrifiber Products	Closeout	Spreadsheet indicating, for each indoor composite wood and agrifiber product used, the manufacturer, product name/model number, if it contains added urea formaldehyde (yes/no) and source of LEED compliance data.		PE
			Closeout	Manufacturer published product data or certification confirming material urea formaldehyde in spreadsheet		PE
EQ5		Indoor Chemical & Pollutant Source Control	Closeout	Spreadsheet indicating, for each permanent entryway system used, the manufacturer, product name/model number and description of system.		PE
			Final Design	List of drawing and specification references that convey locations and installation methods for entryway systems.		ARC
			Final Design	Spreadsheet indicating, for each chemical use area, the room number, room name, description of room separation features (walls, floor/ceilings, openings) and pressure differential from surrounding spaces with doors closed - OR - Statement confirming that project includes no chemical use areas and that no hazardous cleaning materials are needed for building maintenance.		ARC MEC
			Final Design	If project includes chemical use areas: List of drawing and specification references that convey locations of chemical use areas, room separation features and exhaust system.		ARC

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PAR		FEATURE	DUE AT	REQUIRED DOCUMENTATION	DATE REV
			Final Design	If project includes places where water and chemical concentrate mixing occurs: List of drawing and specification references that convey provisions for containment of hazardous liquid wastes OR - Statement confirming that project includes no places where water and chemical concentrate mixing occurs.	ARC MEC
			Closeout	If project includes chemical use areas: Spreadsheet indicating, for AHUs/mechanical ventilation equipment serving occupied areas, the manufacturer, model number, MERV rating, location installed, and if it was replaced immediately prior to occupancy (yes/no) - OR - Statement confirming that project does not use mechanical equipment for ventilation of occupied areas.	PE
EQ6.1		Controllability of Systems: Lighting	Final Design	Calculation indicating total number of individual workstations, number of workstations with individual lighting controls and the percentage of workstations with individual lighting controls.	ELEC
			Final Design	For each shared multi-occupant space, provide a brief description of lighting controls.	ELEC
			Final Design	Narrative describing lighting control strategy, including type and location of individual controls and type and location of controls in shared multi-occupant spaces.	ELEC
EQ6.2		Controllability of Systems: Thermal Comfort	Final Design	Calculation indicating total number of individual workstations, number of workstations with individual thermal comfort controls and the percentage of workstations with individual thermal comfort controls.	MEC
			Final Design	For each shared multi-occupant space, provide a brief description of thermal comfort controls.	MEC
			Final Design	Narrative describing thermal comfort control strategy, including type and location of individual and shared multi-occupant controls.	MEC
EQ7.1		Thermal Comfort: Design	Final Design	Design criteria spreadsheet indicating, for spring, summer, fall and winter, maximum indoor space design temperature, minimum indoor space design temperature and maximum indoor space design humidity.	MEC
			Final Design	Narrative describing method used to establish thermal comfort control conditions and how systems design addresses the design criteria, including compliance with the referenced standard.	MEC
EQ7.2		Thermal Comfort: Verification	Final Design	Narrative describing the scope of work for the thermal comfort survey, including corrective action plan development	MEC
			Final Design	List of drawing and specification references that convey permanent monitoring system.	MEC
EQ8.1		Daylight & Views: Daylight 75% of Spaces	Final Design	Option 2: Table indicating all regularly occupied spaces with space area and space area with compliant daylight zone. Sum of regularly occupied areas and regularly occupied areas with compliant daylight zone. Percentage calculation of areas with compliant daylight zone to total regularly occupied areas.	ARC
			Final Design	Option 1: Simulation model method, software and output data	ELEC
			Final Design	Option 1: Table indicating all regularly occupied spaces with space area, space area with minimum 25 footcandles daylighting illumination, and method of providing glare control. Sum of regularly occupied areas and regularly occupied areas with 25 fc daylighting. Percentage calculation of areas with 25 fc daylighting to total regularly occupied areas.	ELEC
			Final Design	For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.	ARC
			Final Design	List of drawing and specification references that convey exterior glazed opening head and sill heights, glazing performance properties and glare control/sunlight redirection devices.	ARC
			Closeout	Manufacturer published product data or certification confirming glazing Tvis in spreadsheet	PE
EQ8.2		Daylight & Views: Views for 90% of Spaces	Final Design	Table indicating all regularly occupied spaces with space area and space area with access to views. Sum of regularly occupied areas and regularly occupied areas with access to views. Percentage calculation of areas with views to total regularly occupied areas.	ARC
			Final Design	For all occupied spaces excluded from the calculation, provide narrative indicating reasons for excluding the space.	ARC
			Final Design	LEED Floor plan drawings showing line of sight diagramming of views areas in each regularly occupied space. List of drawing/specification references that convey exterior glazed opening head and sill heights.	ARC
<b>INNOVATION &amp; DESIGN PROCESS</b>					

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PAR		FEATURE	DUE AT		REQUIRED DOCUMENTATION	DATE	REV
IDc1.1		Innovation in Design	Final Design		Narrative describing intent, requirement for credit, project approach to the credit. List of drawings and specification references that convey implementation of credit. All other documentation that validates claimed credit.		
IDc1.2		Innovation in Design	Final Design				
IDc1.3		Innovation in Design	Final Design				
IDc1.4		Innovation in Design	Final Design				
IDc2		LEED Accredited Professional	Final Design		Narrative indicating name of LEED AP, company name of LEED AP, description of LEED AP's role and responsibilities in the project.		ARC

**ATTACHMENT F**  
Version 04-07-2011

**BUILDING INFORMATION MODELING REQUIREMENTS**

**1.0 Section 1 - General**

- 1.1. Definitions. See Section 7 for definitions of terms used in this document.
- 1.2. Submittal Format
  - 1.2.1. The Model shall be developed using Building Information Modeling ("BIM") supplemented with Computer Aided Design ("CAD") content as necessary to produce a complete set of Construction Documents. Printed design submittal drawings shall be ANSI D size, suitable for half-size scaled reproduction.
  - 1.2.2. BIM submittals shall conform to the requirements of Sections 3 and 4 below.
  - 1.2.3. For each Center of Standardization (CoS) facility type included in this Project, all Models and associated Facility Data shall be submitted in [Not Supplied - SubmittalReqCADDSystem : BENTLEY\_VERSION]. The submittals shall be fully operable, compatible, and editable within the native BIM tools.

**2.0 Section 2 – Design Requirements**

- 2.1. Use of BIM for Design. Contractor shall use BIM application(s) and software(s) to develop Project designs consistent with the following requirements.
  - 2.1.1. Baseline Model. The Contractor will not be provided a baseline multi-discipline BIM Project Model.
  - 2.1.2. USACE BIM Workspace. The USACE Bentley BIM Workspace [Not Supplied - SubmittalReqCADDSystem : USACE\_WORKSPACE\_VERSION] must be used and can be downloaded from the CAD/BIM Technology Center website, currently <https://cadbim.usace.army.mil>.
  - 2.1.3. Reference. Refer to ERDC TR-06-10, "U.S. Army Corps of Engineers Building Information Modeling Road Map" from the CAD/BIM Technology Center website for more information on the USACE BIM implementation goals.
  - 2.1.4. Industry Foundation Class (IFC) Support. The Contractor's selected BIM application(s) and software(s) must be consistent with the current IFC property sets. Any deviations from or additions to the IFC property sets for any new spaces, systems, and equipment must be submitted for Government acceptance.
  - 2.1.5. BIM Project Execution Plan.
    - 2.1.5.1. Develop a BIM Project Execution Plan ("Plan" or "PxP") documenting the BIM uses, analysis technologies and workflows.
    - 2.1.5.2. Contractors shall utilize the latest version of the USACE BIM PROJECT EXECUTION PLAN (USACE PxP) Template to develop an acceptable Plan. The template can be downloaded from the CAD/BIM Technology Center website, currently <https://cadbim.usace.army.mil>.
- 2.2. BIM Requirements.
  - 2.2.1. Facility Data. Develop the Facility Data to include material definitions and attributes that are necessary for the Project facility design and construction as described in Section 4.0. Additional data in support of Section 6.0 Contractor Electives is encouraged to be added to the Model.
  - 2.2.2. Model Content. The Model and Facility Data shall include, at a minimum, the requirements of Section 4 below.

2.2.3. Model Granularity. Individual elements may vary in level of detail within the Model, but at a minimum must include all features that would be included on a quarter inch (1/4" = 1'0") scaled drawing (e.g., at least 1/16<sup>th</sup>, 1/8<sup>th</sup> and 1/4<sup>th</sup>), or on appropriately scaled civil drawings.

2.3. Output. Submitted Drawings (e.g., plans, elevations, sections, schedules, details, etc.) shall be derived (commonly known as extractions, views or sheets) from the Model and Facility Data. Drawings derived from the Model shall remain connected to the Model for the life of the Project and documented in the PxP. Drawings not derived from the Model shall also be documented in the PxP.

2.3.1. Drawings derived from the Model shall be compliant with the A/E/C CAD Standard. Deliver electronic CAD files used for the creation of the Construction Documents per requirements in Section 01 33 16, the criteria of the USACE Charleston District, and as noted herein.

2.3.2. The CAD file format specified for drawings shall not dictate which application(s) are used for development and execution of the Model and Facility Data. Application(s) used shall be documented in the PxP.

2.4. Quality Control Parameters. Implement quality control ("QC") parameters for the Model, including:

2.4.1. Model Standards Checks. QC validation ensures that the Project Facility Data set has no undefined, incorrectly defined or duplicated elements. Identify and report non-compliant elements and submit a corrective action plan. Provide the Government with detailed justification and request Government acceptance for any non-compliant element that the Contractor proposes to be allowed to remain in the Model.

2.4.2. CAD Standards Checks. QC checking ensures that the fonts, dimensions, line styles, levels and other construction document formatting issues are followed per requirements in Section 01 33 16. Identify and report non-compliant content and submit a corrective action plan.

2.4.3. Other Parameters. Develop such other QC parameters as Contractor deems appropriate for the Project and provide to the Government for acceptance.

2.5. Design and Construction Reviews. Perform design and construction reviews at each submittal stage under Section 3 to test the Model, including:

2.5.1. Visual Checks. Checking to ensure the design intent has been followed and that there are no unintended elements in the Model.

2.5.2. Interference Management Checks. Locate conflicting spatial data in the Model where two elements are occupying the same space. Log hard interferences (e.g., mechanical vs. structural, or mechanical vs. mechanical, overlaps in the same location) and soft interferences, (e.g., conflicts regarding equipment clearance, service access, fireproofing, insulation, code space requirements) in a written report and resolve.

2.5.3. IFC Coordination View. Provide an IFC Coordination View in IFC Express format for all deliverables. Provide exported property set data for all IFC supported named building elements.

2.5.4. Other Parameters. Develop other design and construction review parameters as the Contractor deems appropriate for the Project and provide to the Government for acceptance.

### **3.0 Section 3 – Submittal Requirements**

3.1. General Submittal Requirements.

3.1.1. Provide submittals in compliance with the PxP deliverables at stages as described below.

3.1.2. For each Interim Design Submittal as set forth in Paragraphs 3.3 through 3.6, provide a Contractor-certified written report confirming that consistency checks as identified in Paragraphs 2.4 and 2.5 above have been completed. This report shall be discussed as part of the review process and shall address cross-discipline interferences, if any.

3.1.3. At each Interim Design Submittal as set forth in Paragraphs 3.3 through 3.6, provide the Government with:

3.1.3.1. The Model, Facility Data, Workspace and CAD Data files in the native BIM/CAD format.

3.1.3.2. A copy of the Model in an interactive review format such as Bentley Navigator, Autodesk Navisworks, Adobe 3D PDF 7.0 (or later), Google Earth KMZ or other format per PxP requirements. The format for reviews can change between submittals.

3.1.3.3. A list of all submitted electronic files including a description, directory, and file name for each file submitted. For all CAD printed sheets, include a list of the sheet titles and sheet numbers. Identify which files have been produced from the Model and Facility Data.

3.1.4. The Government shall confirm acceptability of all submittals identified in Section 3 in coordination with the USACE Geographic District BIM Manager.

3.2. Initial Design Conference Submittal.

3.2.1. Submit a digital copy of the PxP where, in addition to Paragraph 3.1.4, the USACE Geographic District BIM Manager will coordinate with the USACE CoS BIM Manager to confirm acceptability of the Plan or advise as to additional processes or activities necessary to be incorporated into the PxP.

3.2.2. Within thirty (30) days after the acceptance of the PxP, conduct a demonstration to review the Plan for clarification, and to verify the functionality of planned Model technology workflow and processes. If modifications are required, the Contractor shall complete the modifications and resubmit the PxP performing a subsequent demonstration for Government acceptance. There will be no payment for design or construction until the PxP is completed and accepted by the Government. The Government may also withhold payment if there is design and construction for unacceptable performance in executing the accepted PxP.

3.3. Interim Design Submittals.

3.3.1. BIM and CAD Data. Submit the Model with Facility Data per the requirements identified in Paragraphs 2.2 and 2.3 as applicable to the Interim Design package(s).

3.4. Final Design Submissions and Design Complete Submittals.

3.4.1. BIM and CAD Data. Submit the Model with Facility Data per the requirements identified in Paragraphs 2.2 and 2.3. Acceptance according to Paragraph 3.1.4 is required before commencement of construction, as described in Paragraph 3.7.6 of Section 01 33 16.

3.5. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model, including interference management and design change tracking information.

3.6. Final As-Built BIM and CAD Data Submittal. Submit the final Model, Facility Data, and CAD files reflecting as-built construction conditions for Government acceptance, as specified in Section 01 78 02.00 10, PROJECT CLOSEOUT.

#### **4.0 Section 4 – BIM Model Minimum Requirements and Output**

4.1. General Provisions. The Model shall be developed to include the systems described below as they would be built, the processes of installing them, and to reflect final as-built construction conditions. The deliverable Model at the Interim Design Stage and at the Final Design Stage (“released for construction”) shall be developed to include as many of the systems described below as are necessary and appropriate at that design stage.

4.2. Architectural/Interior Design. The Architectural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4”=1’0”) scaled drawing. Additional minimum Model requirements include:

4.2.1. Spaces. The Model shall include spaces defining actual net square footage and net volume, and holding data to develop the room finish schedule including room names and numbers. Include program information to verify design space against programmed space, using this information to validate area quantities.

4.2.2. Walls and Curtain Walls. Each wall shall be depicted to the exact height, length, width and ratings (thermal, acoustic, fire) to properly reflect wall types. The Model shall include all walls, both interior and exterior, and the necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.

4.2.3. Doors, Windows and Louvers. Doors, windows and louvers shall be depicted to represent their actual size, type and location. Doors and windows shall be modeled with the necessary intelligence to produce accurate window and door schedules.

4.2.4. Roof. The Model shall include the roof configuration, drainage system, penetrations, specialties, and the necessary intelligence to produce accurate plans, building sections and generic wall sections where roof design elements are depicted.

4.2.5. Floors. The floor slab(s) shall be developed in the Structural Model and then referenced by the Architectural Model.

4.2.6. Ceilings. All heights and other dimensions of ceilings, including soffits, ceiling materials, or other special conditions shall be depicted in the Model with the necessary intelligence to produce accurate plans, building sections and wall sections where ceiling design elements are depicted.

4.2.7. Vertical Circulation. All continuous vertical components (i.e., non-structural shafts, architectural stairs, handrails and guardrails) shall be accurately depicted and shall include the necessary intelligence to produce accurate plans, elevations and sections in which such design elements are referenced.

4.2.8. Architectural Specialties. All architectural specialties (i.e., toilet room accessories, toilet partitions, grab bars, lockers, and display cases) and millwork (i.e., cabinetry and counters) shall be accurately depicted with the necessary intelligence to produce accurate plans, elevations, sections and schedules in which such design elements are referenced.

4.2.9. Signage. The Model shall include all signage and the necessary intelligence to produce accurate plans and schedules.

4.2.10. Schedules. Provide door, window, hardware sets using BHMA designations, flooring, wall finish, and signage schedules from the Model, indicating the type, materials and finishes used in the design.

4.3. Furniture. The furniture Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing, and have necessary intelligence to produce accurate plans. Representation of furniture elements is to be 2D. Contractor may provide a minimal number of 3D representations as examples. Examples of furniture include, but are not limited to, desks, furniture systems, seating, tables, and office storage.

4.3.1. Furniture Coordination. Furniture that makes use of electrical, data or other features shall include the necessary intelligence to produce coordinated documents and data.

4.4. Equipment. The Model may vary in level of detail for individual elements. Equipment shall be depicted to meet layout requirements with the necessary intelligence to produce accurate plans and schedules, indicating the configuration, materials, finishes, mechanical, and electrical requirements.. Examples of equipment include but are not limited to copiers, printers, refrigerators, ice machines and microwaves.

4.4.1. Schedules. Provide furniture and equipment schedules from the model indicating the materials, finishes, mechanical, and electrical requirements.

4.5. Structural. The Structural systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

- 4.5.1. Foundations. All necessary foundation and/or footing elements, with necessary intelligence to produce accurate plans and elevations.
- 4.5.2. Floor Slabs. Structural floor slabs shall be depicted with all necessary recesses, curbs, pads, closure pours, and major penetrations accurately depicted.
- 4.5.3. Structural Steel. All steel columns, primary and secondary framing members, and steel bracing for the roof and floor systems (including decks), including all necessary intelligence to produce accurate structural steel framing plans, related building/wall sections, and schedules.
- 4.5.4. Cast-in-Place Concrete. All walls, columns, beams, including necessary intelligence to produce accurate plans and building/wall sections, depicting cast-in-place concrete elements.
- 4.5.5. Expansion/Contraction Joints. Joints shall be accurately depicted.
- 4.5.6. Stairs. All framing members for stair systems, including necessary intelligence to produce accurate plans and building/wall sections depicting stair design elements.
- 4.5.7. Shafts and Pits. All shafts and pits, including necessary intelligence to produce accurate plans and building/wall sections depicting these design elements.
- 4.5.8. Openings and Penetrations. All major openings and penetrations that would be included on a quarter inch (1/4"=1'0") scaled drawing.
- 4.6. Mechanical. The Mechanical systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Small diameter (less than 1-1/2" NPS) field-routed piping is not required to be depicted in the Model. Additional minimum Model requirements include:
- 4.6.1. HVAC. All necessary heating, ventilating, air-conditioning and specialty equipment, including air distribution for supply, return, ventilation and exhaust ducts, control systems, registers, diffusers, grills, and hydronic baseboards with necessary intelligence to produce accurate plans, elevations, building/wall sections and schedules.
- 4.6.1.1. Mechanical Piping. All necessary piping and fixture layouts, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, and schedules.
- 4.6.2. Plumbing. All necessary plumbing piping and fixture layouts, floor and area drains, and related equipment, including necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules.
- 4.6.3. Equipment Clearances. All Mechanical equipment clearances shall be modeled for use in interference management and maintenance access requirements.
- 4.6.4. Elevator Equipment. All necessary equipment and control systems, including necessary intelligence to produce accurate plans, sections and elevations depicting these design elements.
- 4.7. Electrical/Telecommunications. The Electrical and Telecommunications systems Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Small diameter (less than 1-1/2"Ø) field-routed conduit is not required to be depicted in the Model. Additional minimum Model requirements include:
- 4.7.1. Interior Electrical Power and Lighting. All necessary interior electrical components (i.e., lighting, receptacles, special and general purpose power receptacles, lighting fixtures, panelboards, cable trays and control systems), including necessary intelligence to produce accurate plans, details and schedules. Lighting and power built into furniture/equipment shall be modeled.

4.7.2. Special Electrical. All necessary special electrical components (i.e., security, mass notification, public address, nurse call and other special electrical occupancy sensors, and control systems), including necessary intelligence to produce accurate plans, details and schedules.

4.7.3. Grounding. All necessary grounding components (i.e., lightning protection systems, static grounding systems, communications grounding systems, and bonding), including necessary intelligence to produce accurate plans, details and schedules.

4.7.4. Telecommunications. All existing and new telecommunications service controls and connections, both above ground and underground, with necessary intelligence to produce accurate plans, details and schedules. Cable tray routing shall be modeled without detail of cable contents.

4.7.5. Exterior Building Lighting. All necessary exterior lighting including all lighting fixtures, relevant existing and proposed support utility lines and equipment with necessary intelligence to produce accurate plans, details and schedules.

4.7.6. Equipment Clearances. All Electrical equipment clearances shall be modeled for use in interference management and maintenance access requirements.

4.8. Fire Protection. The fire protection system Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a quarter inch (1/4"=1'0") scaled drawing. Additional minimum Model requirements include:

4.8.1. Fire Protection System. All relevant fire protection components (i.e., branch piping, sprinkler heads, fittings, drains, pumps, tanks, sensors, control panels) with necessary intelligence to produce accurate plans, elevations, building/wall sections, riser diagrams, and schedules. All fire protection piping shall be modeled.

4.8.2. Fire Alarms. Fire alarm/mass notification devices and detection system shall be indicated with necessary intelligence to produce accurate plans depicting them.

4.9. Civil. The Civil Model may vary in level of detail for individual elements, but at a minimum must include all features that would be included on a one inch (1"=100') scaled drawing. Additional minimum Model requirements include:

4.9.1. Terrain (DTM). All relevant site conditions and proposed grading, including necessary intelligence to produce accurate Project site topographical plans and cross sections.

4.9.2. Drainage. All existing and new drainage piping, including upgrades thereto, including necessary intelligence to produce accurate plans and profiles for the Project site.

4.9.3. Storm Water and Sanitary Sewers. All existing and new sewer structures and piping, including upgrades thereto, with necessary connections to mains or other distribution points as appropriate, including necessary intelligence to produce accurate plans and profiles .

4.9.4. Utilities. All necessary new utilities connections from the Project building(s) to the existing or newly-created utilities, and all existing above ground and underground utility conduits, including necessary intelligence to produce accurate plans and site-sections.

4.9.5. Roads and Parking. All necessary roadways, parking lots, and parking structures, including necessary intelligence to produce accurate plans, profiles and cross-sections.

## **5.0 Section 5 - Ownership and Rights in Data**

5.1. Ownership. The Government has ownership of and rights at the date of Closeout Submittal to all CAD files, BIM Model, and Facility Data developed for the Project in accordance with FAR Part 27, clauses incorporated in Section 00 72 00, Contract Clauses and Special Contract Requirement 1.14 GOVERNMENT RE-USE OF DESIGN (Section 00 73 00). The Government may make use of this data following any deliverable.

## **6.0 Section 6 – Contractor Electives**

- 6.1. Applicable Criteria. If the Contractor elected to include one or more of the following features as an elective in its accepted contract proposal for additional credit, as described in the proposal submission requirements and evaluation criteria, the requirements of paragraphs 6.2 through 6.5 are as applicable for those elective feature(s) that will be included in the project.
- 6.2. COBIE Compliance. The Model and Facility Data for the Project shall fulfill Construction Operations Building Information Exchange (COBIE) requirements on the Whole Building Design Guide website ([www.wbdg.org](http://www.wbdg.org)), including all requirements for the indexing and submission of Portable Document Format (PDF) and other appropriate records that would otherwise be printed and submitted in compliance with Project operations and maintenance handover requirements.
- 6.3. Project Scheduling using the Model. In the PxP and during the Initial Design Conference Submittal Demonstration, provide an overview of the use of BIM in the development and support of the Project construction schedule.
- 6.3.1. Submittal Requirements. During the Stages identified in Paragraphs 3.3 through 3.6, the Contractor shall deliver the construction schedule derived from the Model.
- 6.3.1.1. Construction Submittals – Over-The-Shoulder Progress Reviews. Periodic quality control meetings or construction progress review meetings shall include quality control reviews on the implementation and use of the Model for Project scheduling.
- 6.4. Cost Estimating. In the PxP and during the Initial Design Conference Submittal Demonstration, provide an overview of the use of BIM in the development and support of cost estimating, or other costing applications such as comparative cost analysis for proposed changes and estimate validation.
- 6.4.1. Submittal Requirements. During the Stages identified in Paragraphs 3.3 through 3.6, the Contractor shall deliver cost estimating information derived from the Model.
- 6.4.2. Project Completion. At Project completion, the Contractor shall provide an Micro Computer Aided Cost Estimating System Generation II ("MII") Cost Estimate that follows the USACE Cost Engineering Military Work Breakdown System ("WBS"), a modified Uniformat, to at least the sub-systems level and uses quantity information supplied directly from Model output to the maximum extent possible, though other "gap" quantity information will be included by the contractor as necessary for a complete and accurate Cost Estimate. (See Paragraph 6.4.2.2).
- 6.4.2.1. Sub system level extracted quantities from the Model for use within the Estimate shall be provided according to how detailed line items or tasks should be installed/built so that accurate costs can be developed and/or reflected. When developing a Model, the contractor shall be cognizant of construction sequencing at the beginning stages of Model development, such as recognizing tasks performed on the first floor versus the same task on higher floors that will be more labor intensive and, therefore, need to have a separate quantity and be priced differently. Tasks and their extracted quantities from the Model shall be broken down by their location (proximity in the structure) as well as the complexity of installation.
- 6.4.2.2. At all design Stages it shall be acknowledged that BIM output will not generate all quantities that are necessary in order to develop a complete and accurate cost estimate of the Project based on the design alone. (An example of this would be plumbing that is less than 1.5" diameter and, therefore, not expected to be modeled due to permitted level of design granularity; this information is commonly referred to as "The Gap". Quantities addressing "The Gap" and their associated costs shall be included in the final Project actual Cost Estimates as well even though not derived directly from the Model data).
- 6.5. Other Analyses and Reports. Structural, energy and efficiency, EPACT 2005 & EISA 2007, lighting design, daylighting, electrical power, psychrometric processing, shading, programming, LEED, fire protection, code compliance, Life Cycle Cost, acoustic, plumbing and other analyses that may be generated from the Model or reports summarizing the data compiled from these analyses shall be submitted in the form established by contractor in its accepted PxP.

## **7.0 Definitions**

- 7.1. The following definitions apply specifically in the context of this attachment only.



7.2. “Model”: An electronic, three-dimensional representation of facility elements with associated intelligent attribute data (“Facility Data”).

7.3. “Facility Data”: The non-graphical information attached to objects in the Model that defines various characteristics of the object. Facility Data can include properties such as parametric values that drive physical sizes, material definitions and characteristics (e.g. wood, metal), manufacturer data, industry standards (e.g. AISC steel properties), and project identification numbers. Facility Data can also define supplementary physical entities that are not shown graphically in the Model, such as insulation around a duct, or hardware on a door.

7.4. “Workspace”: A collection of content libraries and supporting files that define and embody a BIM standard. A workspace includes BIM libraries such as wall types, standard steel shapes, furniture, HVAC fittings, and sprinkler heads. It also contains sheet libraries such as print/plot configurations, font and text style libraries, and sheet borders and title blocks. The USACE has developed Workspaces specific to USACE BIM standards; these workspaces are dependent on specific versions of the BIM applications they serve. All USACE BIM Workspaces can be downloaded from the CAD/BIM Technology Center (<https://cadbim.usace.army.mil>). In some cases, there is a specific Workspace for a given CoS Facility Standard Design.

7.5. “IFC”: Industry Foundation Class, a standard and file format used for the exchange of BIM data; see [www.iai-tech.org](http://www.iai-tech.org). Note: In the context of this attachment, IFC does not mean “Issued For Construction.”





**ATTACHMENT G****DESIGN SUBMITTAL DIRECTORY AND SUBDIRECTORY FILE ARRANGEMENT**

Organize electronic design submittal files in a subdirectory/file structure in accordance with the following table. The Contractor may suggest a slightly different structure, subject to the discretion of the government.

**Design Submittal Directory and Subdirectory File Arrangement.**

Directory	Sub-Directory	Sub-Directory or Files	Files
Submittal/Package Name	Narratives	PDF file or files with updated design narrative for each applicable design discipline	
	Drawings	PDF (subdirectory)	Single PDF file with all applicable drawing sheets - bookmarked by sheet number and name
		BIM (subdirectory) See Attachment F.	BIM project folder (with files) per the USACE Workspace. Include an Excel drawing index file with each drawing sheet listed by sheet #, name and corresponding dgn file name (Final Design & Design Complete only)
	Design Analysis & Calculations	Individual PDF files containing design analysis and calculations for each discipline applicable to the submittal	
		PDF file with Fire Protection and Life Safety Code Review checklist	
	LEED	PDF file with updated Leed Check List	
		PDF file or files with LEED Templates for each point with applicable documentation included in each file.	
		LEED SUBMITTALS	
	Energy Analysis	PDF with baseline energy consumption analysis	
		PDF with actual building energy consumption analysis	
	Specifications	Single PDF file with table of contents and all applicable specifications sections.	
		Submittal Register (Final Design & Design Complete submittal only)	
	Design Quality Control	PDF file or files with DQC checklist(s) and/or statements	
	Building Rendering(s)	PDF file of rendering for each building type included in contract (Final Design & Design Complete).	

**SECTION 01 45 01.10  
QUALITY CONTROL SYSTEM (QCS)**

**1.0 GENERAL**

- 1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS
- 1.2. QCS SOFTWARE
- 1.3. SYSTEM REQUIREMENTS
- 1.4. RELATED INFORMATION
- 1.5. CONTRACT DATABASE
- 1.6. DATABASE MAINTENANCE
- 1.7. IMPLEMENTATION
- 1.8. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM
- 1.9. MONTHLY COORDINATION MEETING
- 1.10. NOTIFICATION OF NONCOMPLIANCE

## 1.0 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the RMS web site. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration
- Finances
- Quality Control
- Submittal Monitoring
- Scheduling
- Import/Export of Data
- Request for Information
- Accident Reporting
- Safety Exposure Manhours

### 1.1. CORRESPONDENCE AND ELECTRONIC COMMUNICATIONS

For ease and speed of communications, both Government and Contractor will exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

### 1.2. OTHER FACTORS

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01 32 01.00 10, PROJECT SCHEDULE, Section 01 33 00, SUBMITTAL PROCEDURES, and Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

### 1.3. QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

### 1.4. SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

#### (a) Hardware

- IBM-compatible PC with 1000 MHz Pentium or higher processor
- 256 MB RAM for workstation / 512+ MB RAM for server
- 1 GB hard drive disk space for sole use by the QCS system
- Compact disk (CD) Reader, 8x speed or higher
- SVGA or higher resolution monitor (1024 x 768, 256 colors)
- Mouse or other pointing device
- Windows compatible printer (Laser printer must have 4+ MB of RAM)
- Connection to the Internet, minimum 56K BPS

(b) Software

- MS Windows 2000 or higher
- MS Word 2000 or newer
- Latest version of : Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher
- Electronic mail (E-mail), MAPI compatible
- Virus protection software that is regularly upgraded with all issued manufacturer's updates

1.5. RELATED INFORMATION

1.5.1. QCS USER GUIDE

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.5.2. CONTRACTOR QUALITY CONTROL (CQC) TRAINING

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.6. CONTRACT DATABASE

Prior to the pre-construction conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by using the government's SFTP repository built into QCS import/export function. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.7. DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government, e.g., daily reports, submittals, RFI's, schedule updates, payment requests, etc. shall be submitted using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, email or CD-ROM may be used instead (see Paragraph DATA SUBMISSION VIA CD-ROM). The QCS database typically shall include current data on the following items:

1.7.1. ADMINISTRATION

1.7.1.1. Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format.

1.7.1.2. Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format.

1.7.1.3. Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main)

office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

All Requests For Information (RFI) shall be exchanged using the Built-in RFI generator and tracker in QCS.

#### 1.7.1.4. Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

#### 1.7.1.5. Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

### 1.7.2. FINANCES

#### 1.7.2.1. Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the design and construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

#### 1.7.2.2. Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet prompt payment certification, and payment invoice in QCS. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment request, prompt payment certification, and payment invoice with supporting data by using the government's SFTP repository built into QCS export function. If permitted by the Contracting Officer, E-mail or a CD-ROM may be used. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

#### 1.7.3. Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a QCS update reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

#### 1.7.3.1. Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01 45 04.00 10, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government within 24 hours after the date covered by the report. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

#### 1.7.3.2. Deficiency Tracking



The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

#### 1.7.3.3. QC Requirements

The Contractor shall develop and maintain a complete list of QC testing and required structural and life safety special inspections required by the International Code Council (ICC), transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

#### 1.7.3.4. Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

#### 1.7.3.5. Labor and Equipment Hours

The Contractor shall log labor and equipment exposure hours on a daily basis. This data will be rolled up into a monthly exposure report.

#### 1.7.3.6. Accident/Safety Tracking Reporting

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This supplemental entry is not to be considered as a substitute for completion of mandatory notification and reports, e.g., ENG Form 3394 and OSHA Form 300.

#### 1.7.3.7. Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

#### 1.7.3.8. Hazard Analysis

The Contractor shall use QCS to develop a hazard analysis for each feature of work included in its CQC Plan. The hazard analysis shall address any hazards, or potential hazards, that may be associated with the work

#### 1.7.4. Submittal Management

The Government will provide the submittal register form, ENG Form 4288, SUBMITTAL REGISTER, in electronic format. The Contractor and Designer of Record (DOR) shall develop and maintain a complete list of all submittals, including completion of all data columns and shall manage all submittals. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

#### 1.7.5. Schedule

The Contractor shall develop a design and construction schedule consisting of pay activities, in accordance with Section 01 32 01.00 10, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01 32 01.00 10 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

#### 1.7.5.1. Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data from RMS, and schedule data using SDEF.

#### 1.8. IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

#### 1.9. DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of QCS data is by using the government's SFTP repository built into QCS export function.. Other data should be submitted using E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of CD-ROM for data transfer. Data on CDs shall be exported using the QCS built-in export function. If used, CD-ROMs will be submitted in accordance with the following:

##### 1.9.1. File Medium

The Contractor shall submit required data on CD-ROMs. They shall conform to industry standards used in the United States. All data shall be provided in English.

##### 1.9.2. Disk Or Cd-Rom Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

##### 1.9.3. File Names

The files will be automatically named by the QCS software. The naming convention established by the QCS software shall not be altered in any way by the Contractor.

#### 1.10. MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.

The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

#### 1.11. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

End of Section 01 45 01.10

**SECTION 01 45 04.00 10**  
**CONTRACTOR QUALITY CONTROL**

**1.0 GENERAL**

1.1. REFERENCES

1.2. PAYMENT

**2.0 PRODUCTS (NOT APPLICABLE)**

**3.0 EXECUTION**

3.1. GENERAL REQUIREMENTS

3.2. QUALITY CONTROL PLAN

3.3. COORDINATION MEETING

3.4. QUALITY CONTROL ORGANIZATION

3.5. SUBMITTALS AND DELIVERABLES

3.6. CONTROL

3.7. TESTS

3.8. COMPLETION INSPECTION

3.9. DOCUMENTATION

3.10. NOTIFICATION OF NONCOMPLIANCE

## **1.0 GENERAL**

### **1.1. REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Refer to the latest edition, as of the date of the contract solicitation.

- ASTM INTERNATIONAL (ASTM)
- ASTM D 3740 Minimum Requirements for Agencies  
Engaged in the Testing and/or Inspection  
of Soil and Rock as Used in Engineering  
Design and Construction
- ASTM E 329 Agencies Engaged in the Testing  
and/or Inspection of Materials Used in  
Construction
- U.S. ARMY CORPS OF ENGINEERS (USACE)  
ER 1110-1-12 Quality Management

### **1.2. PAYMENT**

There will be no separate payment for providing and maintaining an effective Quality Control program. Include all costs associated therewith in the applicable unit prices or lump-sum prices contained in the Contract Line Item Schedule.

## **2.0 PRODUCTS (Not Applicable)**

## **3.0 EXECUTION**

### **3.1. GENERAL REQUIREMENTS**

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product, which complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed design and construction sequence. The site project superintendent is responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager at the site, responsible for the overall site activities, including but not limited to quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site. Different contractors have different names for the on-site overall project supervisor. For clarification, the term "site project superintendent" refers to the Contractor's senior site representative or "on-site manager", or other similar title, as those terms are used in contract Clause 52.236-7, "Superintendence by the Contractor" and in the Division 00 Section(s) of the solicitation for this contract or task order, or elsewhere in the contract. It does not refer to a construction superintendent, unless that person is also the Contractor's permanently assigned senior site representative in charge of all on-site activities.

### **3.2. QUALITY CONTROL PLAN**

Furnish for Government review, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 30 days of operation. Design and construction may begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. The Government will not permit work outside of the features of work included in an accepted interim plan to begin until acceptance of a CQC Plan or another interim plan containing the additional features of

work to be started. Where the applicable Code issued by the International Code Council calls for an inspection by the Building Official, the Contractor shall include the inspections in the Quality Control Plan and shall perform the inspections. The Designer of Record shall develop a program for any special inspections required by the applicable International Codes and the Contractor shall perform these inspections, using qualified inspectors. Include the special inspection plan in the QC Plan.

### 3.2.1. Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect/engineers (AE), fabricators, suppliers, and purchasing agents:

3.2.1.1. A description of the quality control organization. Include a chart showing lines of authority and an acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. A CQC System Manager shall report to the project superintendent or someone higher in the contractor's organization.

3.2.1.2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Also include those responsible for performing and documenting the inspections required by the International Codes and the special inspection program developed by the designer of record.

3.2.1.3. A copy of the letter to the CQC System Manager, signed by an authorized official of the firm, which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Furnish copies of these letters.

3.2.1.4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents subcontractors, designers of record, consultants, architect engineers (AE), offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

3.2.1.5. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. Use only Government approved Laboratory facilities.

3.2.1.6. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

3.2.1.7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

3.2.1.8. Reporting procedures, including proposed reporting formats.

3.2.1.9. A list of the definable features of work. A definable feature of work is a task, which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.1.10. A list of all inspections required by the International Codes and the special inspection program required by the code and this contract.

### 3.2.2. Additional Requirements for Design Quality Control (DQC) Plan

The following additional requirements apply to the Design Quality Control (DQC) plan:

3.2.2.1. The Contractor's QCP Plan shall provide and maintain a Design Quality Control (DQC) Plan as an effective quality control program which will assure that all services required by this design-build contract are performed and

provided in a manner that meets professional architectural and engineering quality standards. As a minimum, competent, independent reviewers identified in the DQC Plan shall review all documents. Use personnel who were not involved in the design effort to produce the design to perform the independent technical review (ITR). The ITR is intended as a quality control check of the design. Include, at least, but not necessarily limited to, a review of the contract requirements (the accepted contract or task order proposal and amended RFP), the basis of design, design calculations, the design configuration management documentation and check the design documents for errors, omissions, and for coordination and design integration. The ITR team is not required to examine, compare or comment concerning alternate design solutions but should concentrate on ensuring that the design meets the contract requirements. Correct errors and deficiencies in the design documents prior to submitting them to the Government.

3.2.2.2. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit these completed checklists at each design phase as part of the project documentation.

3.2.2.3. A Design Quality Control Manager, who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated, shall implement the DQC Plan. This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. Notify the Government, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

3.2.2.4. Develop and maintain effective, acceptable design configuration management (DCM) procedures to control and track all revisions to the design documents after the Interim Design Submission through submission of the As-Built documents. Include the DCM plan as a subset of the DQC Plan. See Section 'Design After Award'.

### 3.2.3. Acceptance of Plan

Government acceptance of the Contractor's plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.4. Notification of Changes

After acceptance of the CQC Plan, notify the Government in writing of any proposed change. Proposed changes are subject to Government acceptance.

## 3.3. COORDINATION MEETING

After the Postaward Conference, before start of design or construction, and prior to acceptance by the Government of the CQC Plan, the Contractor and the Government shall meet and discuss the Contractor's quality control system. Submit the CQC Plan for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. The Government will prepare minutes of the meeting for signature by both parties. . The minutes shall become a part of the contract file. There may be occasions when either party will call for subsequent conferences to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

## 3.4. QUALITY CONTROL ORGANIZATION

### 3.4.1. Personnel Requirements

The requirements for the CQC organization are a CQC System Manager, a Design Quality Manager, and sufficient number of additional qualified personnel to ensure contract compliance. The CQC organization shall also include personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. Provide adequate office

space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly furnish complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation to the CQC organization. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

#### 3.4.2. CQC System Manager

Identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a BA/BS graduate of an ACCE accredited construction management college program. The CQC system Manager may alternately be an engineering technician with at least 2 years of college and an ICC certification as a Commercial Building Inspector (Residential Building Inspector certification will be required for Military Family Housing projects). In addition, the CQC system manager shall have a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. Assign the CQC System Manager no other duties (except may also serve as Safety and Health Officer, if qualified and if allowed by Section 00 73 00). Identify an alternate for the CQC System Manager in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager but the alternate may have other duties in addition to serving in a temporary capacity as the acting QC manager.

#### 3.4.3. CQC Personnel

3.4.3.1. In addition to CQC personnel specified elsewhere in the contract provide specialized CQC personnel to assist the CQC System Manager in accordance with paragraph titled Area Qualifications.

3.4.3.2. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; **are not intended to be full time, but must be physically present at the construction site during work on their areas of responsibility**; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan. **One person may cover more than one area, provided that they are qualified to perform QC activities for the designated areas below and provided that they have adequate time to perform their duties:**

#### 3.4.4. Experience Matrix

##### 3.4.4.1. Area Qualifications

3.4.4.1.1. Civil - Graduate Civil Engineer or (BA/BS) graduate in construction management with 4 years experience in the type of work being performed on this project or engineering technician with 5 yrs related experience.

3.4.4.1.2. Mechanical - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Mechanical Inspector with 5 yrs related experience.

3.4.4.1.3. Electrical - Graduate Electrical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or engineering technician with an ICC certification as a Commercial Electrical Inspector with 5 yrs related experience.

3.4.4.1.4. Structural - Graduate Structural Engineer or (BA/BS) graduate in construction management with 4 yrs related experience or person with an ICC certification as a Reinforced Concrete Special Inspector and Structural Steel and Bolting Special Inspector (as applicable to the type of construction involved) with 5 yrs related experience.

3.4.4.1.5. Plumbing - Graduate Mechanical Engineer or (BA/BS) graduate in construction management with 4 yrs related experience, or person with an ICC certification as a Commercial Plumbing Inspector with 5 yrs related experience.

- 3.4.4.1.6. Concrete, Pavements and Soils Materials Technician (present while performing tests) with 2 yrs experience for the appropriate area
- 3.4.4.1.7. Testing, Adjusting and Balancing Specialist must be a member (TAB) Personnel of AABC or an experienced technician of the firm certified by the NEBB (present while testing, adjusting, balancing).
- 3.4.4.1.8. Design Quality Control Manager Registered Architect or Professional Engineer (not required on the construction site)
- 3.4.4.1.9. Registered Fire Protection Engineer with 4 years related experience or engineering technician with 5 yrs related experience (but see requirements for Fire Protection Engineer of Record to witness final testing in Section 01 10 00, paragraph 5.10, Fire Protection).
- 3.4.4.1.10. QC personnel assigned to the installation of the telecommunication system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Submit documentation of current BICSI certification. In lieu of BICSI certification, QC personnel shall have a minimum of 5 years experience in the installation of the specified copper and fiber optic cable and components. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products. QC personnel shall witness and certify the testing of telecommunications cabling and equipment.

### 3.4.5. Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management for Contractors". This course is periodically offered at [Not Supplied - ConstructionReqQC : COURSE\_LOCATION]. Inquire of the District or Division sponsoring the course for fees and other expenses involved, if any, for attendance at this course.

### 3.4.6. Organizational Changes

When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

## 3.5. SUBMITTALS AND DELIVERABLES

Make submittals as specified in Section 01 33 00 **SUBMITTAL PROCEDURES**. The CQC organization shall certify that all submittals and deliverables are in compliance with the contract requirements.

## 3.6. CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. The CQC organization shall conduct at least three phases of control for each definable feature of the construction work as follows:

### 3.6.1. Preparatory Phase

Perform this phase prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

3.6.1.1. A review of each paragraph of applicable specifications, reference codes, and standards. Make a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field at the preparatory inspection. Maintain these copies in the field, available for use by Government personnel until final acceptance of the work.

3.6.1.2. A review of the contract drawings.

3.6.1.3. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

3.6.1.4. Review of provisions that have been made to provide required control inspection and testing.



3.6.1.5. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

3.6.1.6. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

3.6.1.7. A review of the appropriate activity hazard analysis to assure safety requirements are met.

3.6.1.8. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

3.6.1.9. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

3.6.1.10. Discussion of the initial control phase.

3.6.1.11. Notify the Government at least 24 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. Document the results of the preparatory phase actions by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

### 3.6.2. Initial Phase

Accomplish this phase at the beginning of a definable feature of work. Include the following actions:

3.6.2.1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

3.6.2.2. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

3.6.2.3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

3.6.2.4. Resolve all differences.

3.6.2.5. Check safety to include compliance with and upgrading of the Accident Prevention plan and activity hazard analysis. Review the activity analysis with each worker.

3.6.2.6. Notify the Government at least 24 hours in advance of beginning the initial phase. The CQC System Manager shall prepare and attach to the daily CQC report separate minutes of this phase. Indicate exact location of initial phase for future reference and comparison with follow-up phases.

3.6.2.7. Repeat the initial phase any time acceptable specified quality standards are not being met.

### 3.6.3. Follow-up Phase

Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Conduct final follow-up checks and correct deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work.

### 3.6.4. Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

### 3.7. TESTS

#### 3.7.1. Testing Procedure

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements and project design documents. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory, or establish an approved testing laboratory at the project site. The Contractor may elect to use a laboratory certified and accredited by the Concrete and cement Reference Laboratory (CCRL) or by AASHTO Materials Reference Laboratory (AMRL) for testing procedures that those organizations certify. The Contractor shall perform the following activities and record and provide the following data:

3.7.1.1. Verify that testing procedures comply with contract requirements and project design documents.

3.7.1.2. Verify that facilities and testing equipment are available and comply with testing standards.

3.7.1.3. Check test instrument calibration data against certified standards.

3.7.1.4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

3.7.1.5. Include results of all tests taken, both passing and failing tests, recorded on the CQC report for the date taken. Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

#### 3.7.2. Testing Laboratories

##### 3.7.2.1. Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

##### 3.7.2.2. Capability Recheck

If the selected laboratory fails the capability check, the Government will assess the Contractor a charge of \$1,375 to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

#### 3.7.3. Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

#### 3.7.4. Furnishing or Transportation of Samples for Government Quality Assurance Testing

The Contractor is responsible for costs incidental to the transportation of samples or materials. Deliver samples of materials for test verification and acceptance testing by the Government to the Corps of Engineers Laboratory, f.o.b., at the following address:

- For delivery by mail:
  - [Not Supplied - ConstructionReqQC : LAB\_NAME]
  - [Not Supplied - ConstructionReqQC : LAB\_ATTN]
  - [Not Supplied - ConstructionReqQC : LAB\_MAIL]
  - [Not Supplied - ConstructionReqQC : LAB\_STATE]
- For other deliveries:
  - [Not Supplied - ConstructionReqQC : LAB\_NAME\_OTHER]
  - [Not Supplied - ConstructionReqQC : LAB\_ATTN\_OTHER]
  - [Not Supplied - ConstructionReqQC : LAB\_MAIL\_OTHER]
  - [Not Supplied - ConstructionReqQC : LAB\_STATE\_OTHER]

The area or resident office will coordinate, exact delivery location, and dates for each specific test.

### 3.8. COMPLETION INSPECTION

#### 3.8.1. Punch-Out Inspection

Near the end of the work, or any increment of the work established by a time stated in the SPECIAL CONTRACT REQUIREMENTS Clause, "Commencement, Prosecution, and Completion of Work", or by the specifications, the CQC Manager shall conduct an inspection of the work. Prepare a punch list of items which do not conform to the approved drawings and specifications and include in the CQC documentation, as required by paragraph DOCUMENTATION. The list of deficiencies shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

#### 3.8.2. Pre-Final Inspection

As soon as practicable after the notification above, the Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Correct any items noted on the Pre-Final inspection in a timely manner. Accomplish these inspections and any deficiency corrections required by this paragraph within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

#### 3.8.3. Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall attend the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups and major commands may also attend. The Government will formally schedule the final acceptance inspection based upon results of the Pre-Final inspection. Provide notice to the Government at least 14 days prior to the final acceptance inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

### 3.9. DOCUMENTATION

3.9.1. Maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers using government-provided software, QCS (see Section 01 45 01.10). The report includes, as a minimum, the following information:

- 3.9.1.1. Contractor/subcontractor and their area of responsibility.
  - 3.9.1.2. Operating plant/equipment with hours worked, idle, or down for repair.
  - 3.9.1.3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
  - 3.9.1.4. Test and/or control activities performed with results and references to specifications/drawings requirements. Identify the applicable control phase (Preparatory, Initial, Follow-up). List deficiencies noted, along with corrective action.
  - 3.9.1.5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
  - 3.9.1.6. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.
  - 3.9.1.7. Offsite surveillance activities, including actions taken.
  - 3.9.1.8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
  - 3.9.1.9. Instructions given/received and conflicts in plans and/or specifications.
  - 3.9.1.10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identity of the ITR team, the ITR review comments, responses and the record of resolution of the comments.
- 3.9.2. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Furnish the original and one copy of these records in report form to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, submit one report for every 7 days of no work and on the last day of a no work period. Account for all calendar days throughout the life of the contract. The first report following a day of no work shall be for that day only. The CQC System Manager shall sign and date reports. The report shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel. The Contractor may submit these forms electronically, in lieu of hard copy.

### 3.10. NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

End of Section 01 45 04.00 10

**SECTION 01 50 02  
TEMPORARY CONSTRUCTION FACILITIES**

**1.0 OVERVIEW**

1.1. GENERAL REQUIREMENTS

1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

1.5. MAINTENANCE OF CONSTRUCTION SITE

## 1.0 OVERVIEW

### 1.1. GENERAL REQUIREMENTS

#### 1.1.1. Site Plan

Prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Also indicate if the use of a supplemental or other staging area is desired.

### 1.2. AVAILABILITY AND USE OF UTILITY SERVICES

1.2.1. See Section 00 72 00, Contract Clauses and Section 00 73 00, Special Contract Requirements, for Utility Availability requirements.

#### 1.2.2. Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

#### 1.2.3. Telephone

Make arrangements and pay all costs for desired telephone facilities.

### 1.3. BULLETIN BOARD, PROJECT SIGN, AND PROJECT SAFETY SIGN

#### 1.3.1. Bulletin Board

Immediately upon beginning of onsite work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the contract, Wage Rate Information poster, and other information approved by the Contracting Officer. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Contracting Officer. Display legible copies of the aforementioned data until work is completed. Remove the bulletin board from the site upon completion of the project.

#### 1.3.2. Project and Safety Signs

Erect a project sign and a site safety sign with informational details as provided by the Government at the Post award conference, within 15 days prior to any work activity on project site. Update the safety sign data daily, with light colored metallic or non-metallic numerals. Remove the signs from the site upon completion of the project. Engineer Pamphlet EP 310-1-6a contains the standardized layout and construction details for the signs. It can be found through a GOOGLE Search or try <http://www.usace.army.mil/publications/eng-pamphlets/ep310-1-6a/s-16.pdf>.

### 1.4. PROTECTION AND MAINTENANCE OF TRAFFIC

Provide access and temporary relocated roads as necessary to maintain traffic. Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Take measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, as required by the State and local authorities having jurisdiction. Protect the traveling public from damage to person and property.

The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. Investigate the adequacy of existing roads and the allowable load limit on these roads. Repair any damage to roads caused by construction operations.

#### 1.4.1. Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct haul roads with suitable grades and widths. Avoid sharp curves, blind corners, and dangerous cross traffic. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Provide adequate lighting to assure full and clear visibility for full width of haul road and work areas during any night work operations. Remove haul roads designated by the Contracting Officer upon completion of the work and restore those areas.

#### 1.4.2. Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

#### 1.5. MAINTENANCE OF CONSTRUCTION SITE

Mow grass and vegetation located within the boundaries of the construction site for the duration of the project, from NTP to contract completion. Edge or neatly trim grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers from NTP to contract completion.

End of Section 01 50 02

**SECTION 01 57 20.00 10  
ENVIRONMENTAL PROTECTION**

**1.0 GENERAL REQUIREMENTS**

- 1.1. SUBCONTRACTORS
- 1.2. ENVIRONMENTAL PROTECTION PLAN
- 1.3. PROTECTION FEATURES
- 1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS
- 1.5. NOTIFICATION

**2.0 PRODUCTS (NOT USED)**

**3.0 EXECUTION**

- 3.1. LAND RESOURCES
- 3.2. WATER RESOURCES
- 3.3. AIR RESOURCES
- 3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL
- 3.5. RECYCLING AND WASTE MINIMIZATION
- 3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES
- 3.7. BIOLOGICAL RESOURCES
- 3.8. INTEGRATED PEST MANAGEMENT
- 3.9. PREVIOUSLY USED EQUIPMENT
- 3.10. MILITARY MUNITIONS
- 3.11. TRAINING OF CONTRACTOR PERSONNEL
- 3.12. POST CONSTRUCTION CLEANUP



## 1.0 GENERAL REQUIREMENTS

Minimize environmental pollution and damage that may occur as the result of construction operations. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this contract. Comply with all applicable environmental Federal, State, and local laws and regulations. The Contractor shall be responsible for any delays resulting from failure to comply with environmental laws and regulations

### 1.1. SUBCONTRACTORS

Ensure compliance with this section by subcontractors.

### 1.2. ENVIRONMENTAL PROTECTION PLAN

1.2.1. The purpose of the Environmental Protection Plan is to present a comprehensive overview of known or potential environmental issues which the Contractor must address during construction. Define issues of concern within the Environmental Protection Plan as outlined in this section. Address each topic in the plan at a level of detail commensurate with the environmental issue and required construction task(s). Identify and discuss topics or issues which are not identified in this section, but which the Contractor considers necessary, after those items formally identified in this section. Prior to commencing construction activities or delivery of materials to the site, submit the Plan for review and Government approval. The Contractor shall meet with the Government prior to implementation of the Environmental Protection Plan, for the purpose of discussing the implementation of the initial plan; possible subsequent additions and revisions to the plan including any reporting requirements; and methods for administration of the Contractor's Environmental Plans. Maintain and keep the Environmental Protection Plan current onsite.

#### 1.2.2. Compliance

No requirement in this Section shall be construed as relieving the Contractor of any applicable Federal, State, and local environmental protection laws and regulations. During Construction, the Contractor shall be responsible for identifying, implementing, and submitting for approval any additional requirements to be included in the Environmental Protection Plan.

#### 1.2.3. Contents

The plan shall include, but shall not be limited to, the following:

1.2.3.1. Name(s) of person(s) within the Contractor's organization who is(are) responsible for ensuring adherence to the Environmental Protection Plan.

1.2.3.2. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site, if applicable

1.2.3.3. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel

1.2.3.4. Description of the Contractor's environmental protection personnel training program

1.2.3.5. An erosion and sediment control plan which identifies the type and location of the erosion and sediment controls to be provided. Include monitoring and reporting requirements to assure that the control measures are in compliance with the erosion and sediment control plan, Federal, State, and local laws and regulations. A Storm Water Pollution Prevention Plan (SWPPP) may be substituted for this plan.

1.2.3.6. Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on the site

1.2.3.7. Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Include measures to minimize the amount of mud transported onto paved public roads by vehicles or runoff.

1.2.3.8. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Include measures for marking the limits of use areas including methods for protection of features to be preserved within authorized work areas.

1.2.3.9. Drawing showing the location of on-installation borrow areas.

1.2.3.10. A spill control plan shall include the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355, and/or regulated under State or Local laws and regulations. The spill control plan supplements the requirements of EM 385-1-1. This plan shall include as a minimum:

- (a) The name of the individual who will report any spills or hazardous substance releases and who will follow up with complete documentation. This individual shall immediately notify the Government and the local Fire Department in addition to the legally required Federal, State, and local reporting channels (including the National Response Center 1-800-424-8802) if a reportable quantity is released to the environment. The plan shall contain a list of the required reporting channels and telephone numbers.
- (b) The name and qualifications of the individual who will be responsible for implementing and supervising the containment and cleanup
- (c) Training requirements for Contractor's personnel and methods of accomplishing the training
- (d) A list of materials and equipment to be immediately available at the job site, tailored to cleanup work of the potential hazard(s) identified.
- (e) The names and locations of suppliers of containment materials and locations of additional fuel oil recovery, cleanup, restoration, and material-placement equipment available in case of an unforeseen spill emergency
- (f) The methods and procedures to be used for expeditious contaminant cleanup

1.2.3.11. A solid waste management plan identifying waste minimization, collection, and disposals methods, waste streams (type and quantity), and locations for solid waste diversion/disposal including clearing debris and C&D waste that is diverted (salvaged, reused, or recycled). Detail the contractor's actions to comply with, and to participate in, Federal, state, regional, local government, and installation sponsored recycling programs to reduce the volume of solid waste at the source. Identify any subcontractors responsible for the transportation, salvage and disposal of solid waste. Submit licenses or permits for solid waste disposal sites that are not a commercial operating facility. Attach evidence of the facility's ability to accept the solid waste to this plan. A construction and demolition waste management plan, similar to the plan specified in the UFGS 01 74 19 (formerly 01572) may be used as the non-hazardous solid waste management plan. Provide a Non-Hazardous Solid Waste Diversion Report. Submit the report on the first working day after the first quarter that non-hazardous solid waste has been disposed and/or diverted and each quarter thereafter (e.g. the first working day of January, April, July, and October) until the end of the project. Additionally, a summary report, with all data fields, is required at the end of the project. The report shall indicate the total type and amount of waste generated, total type and amount of waste diverted, type and amount of waste sent to waste-to-energy facility and alternative daily cover, in tons along with the percent that was diverted. Maintain, track and report construction and demolition waste data in a manner such that the installation can enter the data into the Army SWAR database, which separates data by type of material. A cumulative report in LEED Letter Template format may be used but must be modified to include the date disposed of/diverted and include the above stated diversion data. NOTE: The Solid Waste Diversion Reports are separate documentation than the LEED documentation.

1.2.3.12. DELETED.

1.2.3.13. An air pollution control plan detailing provisions to assure that dust, debris, materials, trash, etc., do not become air borne and travel off the project site.

1.2.3.14. A contaminant prevention plan that: identifies potentially hazardous substances to be used on the job site; identifies the intended actions to prevent introduction of such materials into the air, water, or ground; and details provisions for compliance with Federal, State, and local laws and regulations for storage and handling of

these materials. In accordance with EM 385-1-1, include a copy of the Material Safety Data Sheets (MSDS) and the maximum quantity of each hazardous material to be on site at any given time in the contaminant prevention plan. Update the plan as new hazardous materials are brought on site or removed from the site. Reference this plan in the storm water pollution prevention plan, as applicable.

1.2.3.15. A waste water management plan that identifies the methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines. If a settling/retention pond is required, include the design of the pond including drawings, removal plan, and testing requirements for possible pollutants. If land application will be the method of disposal for the waste water, include a sketch showing the location for land application along with a description of the pretreatment methods to be implemented and any required permits. If surface discharge will be the method of disposal, include a copy of the permit and associated documents as an attachment prior to discharging the waste water. If disposal is to a sanitary sewer, include documentation that the waste water treatment plant Operator has approved the flow rate, volume, and type of discharge.

1.2.3.16. A historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on the project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in the area are discovered during construction. Include methods to assure the protection of known or discovered resources and shall identify lines of communication between Contractor personnel and the Government.

1.2.3.17. A pesticide treatment plan, updated, as information becomes available. Include: sequence of treatment, dates, times, locations, pesticide trade name, EPA registration numbers, authorized uses, chemical composition, formulation, original and applied concentration, application rates of active ingredient (i.e. pounds of active ingredient applied), equipment used for application and calibration of equipment. The Contractor is responsible for Federal, State, Regional and Local pest management record keeping and reporting requirements as well as any additional Installation specific requirements. Follow AR 200-1, Chapter 5, Pest Management, Section 5-4, "Program Requirements" for data required to be reported to the Installation.

### 1.3. PROTECTION FEATURES

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS. Prior to start of any onsite construction activities, the Contractor and the Government shall make a joint condition survey. Immediately following the survey, the Contractor shall prepare a brief report including a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. Both the Contractor and the Government will sign this survey, upon mutual agreement as to its accuracy and completeness. The Contractor develop a plan that depicts how it will protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference which their preservation may cause to the Contractor's work under the contract.

### 1.4. ENVIRONMENTAL ASSESSMENT OF CONTRACT DEVIATIONS

Any deviations, requested by the Contractor, from the drawings, plans and specifications which may have an environmental impact will be subject to approval by the Government and may require an extended review, processing, and approval time. The Government reserves the right to disapprove alternate methods, even if they are more cost effective, if the Government determines that the proposed alternate method will have an adverse environmental impact.

### 1.5. NOTIFICATION

The Government will notify the Contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the Contractor's Environmental Protection plan. The Contractor shall, after receipt of such notice, inform the Government of the proposed corrective action and take such action when approved by the Government. The Government may issue an order stopping all or part of the

work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the Contractor for any such suspensions. This is in addition to any other actions the Government may take under the contract, or in accordance with the Federal Acquisition Regulation or Federal Law.

## **2.0 PRODUCTS (NOT USED)**

## **3.0 EXECUTION**

### **3.1. LAND RESOURCES**

Confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, identify any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. Do not attach or fasten any ropes, cables, or guys to any trees for anchorage unless specifically authorized. Provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Remove all stone, soil, or other materials displaced into uncleared areas..

#### **3.1.1. Work Area Limits**

Prior to commencing construction activities, mark the areas that need not be disturbed under this contract. Mark or fence isolated areas within the general work area which are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, any markers shall be visible in the dark. Personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

#### **3.1.2. Landscape**

Clearly identify trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved by marking, fencing, or wrapping with boards, or any other approved techniques. Restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

#### **3.1.3. Erosion and Sediment Controls**

Provide erosion and sediment control measures in accordance with Federal, State, and local laws and regulations. Coordinate with approving authorities (federal, state, etc.) for specific requirements to be included in the plan. The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's construction activities. Keep the area of bare soil exposed at any one time by construction operations to a minimum necessary. Construct or install temporary and permanent erosion and sediment control best management practices (BMPs). BMPs may include, but not be limited to, vegetation cover, stream bank stabilization, slope stabilization, silt fences, construction of terraces, interceptor channels, sediment traps, inlet and outfall protection, diversion channels, and sedimentation basins. Remove any temporary measures after the area has been stabilized.

#### **3.1.4. Contractor Facilities and Work Areas**

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Government. Make only approved temporary movement or relocation of Contractor facilities. Provide erosion and sediment controls for on-site borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant and/or work areas to protect adjacent areas.

### **3.2. WATER RESOURCES**

Monitor construction activities to prevent pollution of surface and ground waters. Do not apply toxic or hazardous chemicals to soil or vegetation unless otherwise indicated. Monitor all water areas affected by construction activities. For construction activities immediately adjacent to impaired surface waters, the Contractor shall be capable of quantifying sediment or pollutant loading to that surface water when required by state or federally issued Clean Water Act permits.

### 3.2.1. Stream Crossings

Stream crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State, and local governments or impede state-designated flows.

### 3.2.2. Wetlands

Do not enter, disturb, destroy, or allow discharge of contaminants into any wetlands.

## 3.3. AIR RESOURCES

Comply with all Federal and State air emission and performance laws and standards for equipment operation, activities, or processes.

### 3.3.1. Particulates

Control dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, such as from asphaltic batch plants, including weekends, holidays and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the Federal, State, and local air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators or other methods are permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with all State and local visibility regulations.

### 3.3.2. Odors

Control odors from construction activities at all times. Odors shall not cause a health hazard and shall be in compliance with State regulations and/or local ordinances.

### 3.3.3. Sound Intrusions

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the state and Installation rules.

### 3.3.4. Burning

Burning is not allowed on the project site unless specified in other sections of the specifications or by written authorization. Specific times, locations, and manners of burning shall be subject to approval.

## 3.4. CHEMICAL MATERIALS MANAGEMENT AND WASTE DISPOSAL

Disposal of wastes shall be as directed below, unless otherwise specified in other sections and/or shown on the drawings.

### 3.4.1. Solid Wastes

Place solid wastes (excluding clearing debris) in containers which are emptied on a regular schedule. Conduct handling, storage, and disposal to prevent contamination. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with solid waste. Transport solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. The minimum acceptable off-site solid waste disposal option is a Subtitle D RCRA permitted landfill. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Comply with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

### 3.4.2. Chemicals and Chemical Wastes

Dispense chemicals, ensuring no spillage to the ground or water. Perform and document periodic inspections of dispensing areas to identify leakage and initiate corrective action. The Government may periodically review this documentation. Collect chemical waste in corrosion resistant, compatible containers. Monitor and remove collection drums to a staging or storage area when contents are within 6 inches of the top. Classify, manage, store, and dispose of wastes in accordance with Federal, State, and local laws and regulations.

#### 3.4.3. Contractor Generated Hazardous Wastes/Excess Hazardous Materials

Hazardous wastes are defined in 40 CFR 261, or are as defined by applicable state and local regulations. Hazardous materials are defined in 49 CFR 171 - 178. At a minimum, manage and store hazardous waste in compliance with 40 CFR 262. Take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing. Segregate hazardous waste from other materials and wastes; protect it from the weather by placing it in a safe covered location and take precautionary measures, such as berming or other appropriate measures, against accidental spillage. Store, describe, package, label, mark, and placard hazardous waste and hazardous material in accordance with 49 CFR 171 - 178, state, and local laws and regulations. Transport Contractor generated hazardous waste off Government property in accordance with the Environmental Protection Agency and the Department of Transportation laws and regulations. Dispose of hazardous waste in compliance with Federal, State and local laws and regulations. Immediately report spills of hazardous or toxic materials to the Government and the Facility Environmental Office. Contractor will be responsible for cleanup and cleanup costs due to spills. Contractor is responsible for the disposition of Contractor generated hazardous waste and excess hazardous materials.

#### 3.4.4. Fuel and Lubricants

Conduct storage, fueling and lubrication of equipment and motor vehicles in a manner that affords the maximum protection against spill and evaporation. Manage and store fuel, lubricants and oil in accordance with all Federal, State, Regional, and local laws and regulations.

### 3.5. RECYCLING AND WASTE MINIMIZATION

Participate in State and local government sponsored recycling programs. The Contractor is further encouraged to minimize solid waste generation throughout the duration of the project. Line and berm fueling areas and establish storm water control structures at discharge points for site run-off. Keep a liquid containment clean-up kit available at the fueling area.

### 3.6. HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Existing historical, archaeological, and cultural resources within the Contractor's work area are shown on the drawings. Protect and preserve these resources during the life of the Contract. Temporarily suspend all activities that may damage or alter such resources, if any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found during excavation or other construction activities. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, notify the Government so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources.

### 3.7. BIOLOGICAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitat. Protect threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations.

### 3.8. INTEGRATED PEST MANAGEMENT

Coordinate, through the Government, with the Installation Pest Management Coordinator (IPMC) at the earliest possible time prior to pesticide application, in order to minimize impacts to existing fauna and flora. Discuss

integrated pest management strategies with the IPMC and receive concurrence from the IPMC, through the COR, prior to the application of any pesticide associated with these specifications. Give IMPC personnel the opportunity to be present at all meetings concerning treatment measures for pest or disease control and during application of the pesticide. The use and management of pesticides are regulated under 40 CFR 152 - 186.

#### 3.8.1. Pesticide Delivery and Storage

Deliver pesticides, approved for use on the Installation, to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

#### 3.8.2. Qualifications

Use the services of a subcontractor for pesticide application whose principal business is pest control. The subcontractor shall be licensed and certified in the state where the work is to be performed.

#### 3.8.3. Pesticide Handling Requirements

Formulate, treat with, and dispose of pesticides and associated containers in accordance with label directions.

#### 3.8.4. Application

A state certified pesticide applicator shall apply pesticides in accordance with EPA label restrictions and recommendations.

#### 3.9. PREVIOUSLY USED EQUIPMENT

Clean all previously used construction equipment prior to bringing it onto the project site. Ensure that the equipment is free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the USDA jurisdictional office for additional cleaning requirements.

#### 3.10. MILITARY MUNITIONS

Immediately stop work in that area and immediately inform the Government, in the event military munitions, as defined in 40 CFR 260, are discovered or uncovered.

#### 3.11. TRAINING OF CONTRACTOR PERSONNEL

Train personnel in all phases of environmental protection and pollution control. Conduct environmental protection/pollution control meetings for all Contractor personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. The training and meeting agenda shall include methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, wetlands, and endangered species and their habitat that are known to be in the area.

#### 3.12. POST CONSTRUCTION CLEANUP

Clean up all areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing, obliterate all signs of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade, fill and seed the entire disturbed area, unless otherwise indicated.

**SECTION 01 62 35  
RECYCLED/RECOVERED MATERIAL**

**1.0 GENERAL**

1.1. REFERENCES

1.2. OBJECTIVES

1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK



## 1.0 GENERAL

### 1.1. REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

- U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
- 40 CFR 247 Comprehensive Procurement Guideline for Products Containing Recovered Materials

### 1.2. OBJECTIVES

Government procurement policy is to acquire, in a cost effective manner, items containing the highest percentage of recycled and recovered materials practicable consistent with maintaining a satisfactory level of competition without adversely affecting performance requirements or exposing suppliers' employees to undue hazards from the recovered materials. The Environmental Protection Agency (EPA) has designated certain items which must contain a specified percent range of recovered or recycled materials. The Contractor shall make all reasonable efforts to use recycled and recovered materials in providing the EPA designated products and in otherwise utilizing recycled and recovered materials in the execution of the work.

### 1.3. EPA DESIGNATED ITEMS INCORPORATED IN THE WORK

Materials that have been designated by EPA as being products which are or can be made with recovered or recycled materials, when incorporated into the work under this contract, shall contain at least the minimum percentage of recycled or recovered materials indicated by EPA unless adequate justification (non-availability) for non-use is provided. When a designated item is specified as an option to a non-designated item, the designated item requirements apply only if the designated item is used in the work.

### 1.4. EPA PROPOSED ITEMS INCORPORATED IN THE WORK

Products other than those designated by EPA are still being researched and are being considered for future Comprehensive Procurement Guideline (CPG) designation. It is recommended that these items, when incorporated in the work under this contract, contain the highest practicable percentage of recycled or recovered materials, provided specified requirements are also met.

### 1.5. EPA LISTED ITEMS USED IN CONDUCT OF THE WORK BUT NOT INCORPORATED IN THE WORK

There are many products listed in 40 CFR 247 which have been designated or proposed by EPA to include recycled or recovered materials that may be use by the Contractor in performing the work but will not be incorporated into the work. These products include office products, temporary traffic control products, and pallets. It is recommended that these non-construction products, when used in the conduct of the work, contain the highest practicable percentage of recycled or recovered materials and that these products be recycled when no longer needed.

End of Section 01 62 35

**SECTION 01 78 02.00 10  
CLOSEOUT SUBMITTALS**

**1.0 OVERVIEW**

- 1.1. SUBMITTALS
- 1.2. PROJECT RECORD DOCUMENTS
- 1.3. EQUIPMENT DATA
- 1.4. CONSTRUCTION WARRANTY MANAGEMENT
- 1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING
- 1.6. OPERATION AND MAINTENANCE MANUALS
- 1.7. FIELD TRAINING
- 1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY
- 1.9. LEED REVIEW MEETINGS
- 1.10. RED ZONE MEETING
- 1.11. FINAL CLEANING
- 1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY"

**EXHIBIT 1 SAMPLE RED ZONE MEETING CHECKLIST**

## 1.0 OVERVIEW

### 1.1. SUBMITTALS

Government approval is required for any submittals with a "G" designation; submittals not having a "G" designation are for Designer of Record approval or for information only. Submit the following in accordance with Section 01 33 00 submittals:

#### SD-02 Shop Drawings

- As-Built Drawings - G
  - Drawings showing final as-built conditions of the project. Provide electronic drawing files as specified in Section 01 33 16, 3 sets of blue-line prints, one set of reproducible mylar drawings and one set of the approved working as-built drawings.

#### SD-03 Product Data

- As-Built Record of Equipment and Materials
  - Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.
- Construction Warranty Management Plan
  - Three sets of the construction warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. Furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.
- Warranty Tags
  - Two record copies of the warranty tags showing the layout and design.
- Final Cleaning
  - Two copies of the listing of completed final clean-up items.

### 1.2. PROJECT RECORD DOCUMENTS

#### 1.2.1. As-Built Drawings – G

An as-built drawing is a construction drawing revised to reflect the final as-built conditions of the project as a result of modifications and corrections to the project design required during construction. The final as-built drawings shall not have the appearance of marked up drawings, but that of professionally prepared drawings as if they were the "as designed" drawings.

#### 1.2.2. Maintenance of As-Built Drawings

1.2.2.1. The Configuration Management Plan shall describe how the Contractor will maintain up-to-date drawings, how it will control and designate revisions to the drawings and specifications (In accordance with Special Contract Requirement: ***Deviating from the Accepted Design*** and Section 01 33 16: ***Design after Award***, the Designer of Record's approval is necessary for any revisions to the accepted design).

1.2.2.2. Make timely updates, carefully maintaining a record set of working as-built drawings at the job site, marked in red, of all changes and corrections from the construction drawings. Enter changes and corrections on drawings promptly to reflect "Current Construction". Perform this update no less frequently than weekly for the blue line drawings and update no less frequently than quarterly for the CADD/CAD and BIM files, which were prepared previously in accordance with Section 01 33 16. Include a confirmation that the as-builts are up to date with the submission of the monthly project schedule.

1.2.2.3. If the DB Contractor fails to maintain the as-built drawings as required herein, the Government will retain from the monthly progress payment, an amount representing the estimated monthly cost of maintaining the as-built drawings. Final payment with respect to separately priced facilities or the contract as a whole will be withheld until the Contractor submits acceptable as-built drawings and the Government approves them.

1.2.2.4. The marked-up set of drawings shall reflect any changes, alterations, adjustments or modifications. Changes must be reflected on all sheets affected by the change. Changes shall include marking the drawings to reflect structural details, foundation layouts, equipment sizes, and other extensions of design.

1.2.2.5. Typically, room numbers shown on the drawings are selected for design convenience and do not represent the actual numbers intended for use by the end user. Final as-built drawings shall reflect actual room numbers adopted by the end user.

1.2.2.6. If there is no separate contract line item (CLIN) for as-built drawings, the Government will withhold the amount of \$35,000, or 1% of the present construction value, whichever is the greater, until the final as-built drawing submittal has been approved by the Government.

### 1.2.3. Underground Utilities

The drawings shall indicate, in addition to all changes and corrections, the actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Locate Valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Record average elevation of the top of each run or underground structure..

### 1.2.4. Partial Occupancy

For projects where portions of construction are to be occupied or activated before overall project completion, including portions of utility systems, supply as-built drawings for those portions of the facility being occupied or activated at the time the facility is occupied or activated. Show this same as-built information previously furnished on the final set of as-built drawings.

### 1.2.5. As-Built Conditions That are Different From the construction Drawings

Accurately reflect all as-built conditions that are different, such as dimensions, road alignments and grades, and drainage and elevations, from the construction drawings on each drawing. If the as-built condition is accurately reflected on a shop drawing, then furnish that shop drawing in CADD format. Reference the final as-built construction drawing the shop drawing file that includes the as-built information. In turn, the shop drawing shall reference the applicable construction as-built drawing. Delete any options shown on drawings and not selected clearly reflect options selected on final as-built drawings.

### 1.2.6. Additional As-Built Information that Exceeds the Detail Shown on the construction Drawings:

These as-built conditions include those that reflect structural details, foundation layouts, equipment, sizes, mechanical and electrical room layouts and other extensions of design, that were not shown in the project design documents because the exact details were not known until after the time of approved shop drawings. It is recognized that these shop drawing submittals (revised showing as-built conditions) will serve as the as-built record without actual incorporation into the construction drawings, piping, and equipment drawings. Include locations of all explorations, logs of all explorations, and results of all laboratory testing, including those provided by the Government. Furnish all such shop drawings in CADD /CADformat. Include fire protection details, such as wiring, performed for the design of the project.

### 1.2.7. Final As-Built Drawings

Submit final as-built CADD/CAD and BIM Model(s) and Facility Data files at the time of Beneficial Occupancy of the project or at a designated phase of the project. In the event the Contractor accomplishes additional work after this submittal, which changes the as-built conditions, submit a new DVD with all drawing sheets, one copy of affected Mylars and three blue-line copies of affected sheets which depict additional changes.

### 1.2.8. Title Blocks

In accordance with the configuration management plan, clearly mark title blocks to indicate final as-built drawings.

### 1.2.9. Other As-Built Documents

Provide scans of all other documents such as design analysis, catalog cuts, certification documents that are not available in native electronic format in an organized manner in Adobe.pdf format.

#### 1.2.9.1. LEED Documentation

Update LEED documentation on at least a monthly basis and have it available for review by the Government on the jobsite at all times during construction. Submit the final LEED Project Checklist(s), final LEED submittals checklist and complete project documentation, verifying the final LEED score and establishing the final rating. Provide full support to the validation review process, including credit audits. See also the LEED documentation requirements in Section 01 33 16, DESIGN AFTER AWARD.

#### 1.2.9.2. GIS Documentation

Provide final geo-referenced GIS database of the new building footprint along with any changes made to exterior of the building. The intent of capturing the final building footprint and exterior modifications in a GIS database is to provide the installation with a data set of the comprehensive changes made to the landscape as a result of the construction project. The Government will incorporate this data set into the installations existing GIS MasterPlan or Enterprise GIS system. The GIS database deliverable shall follow a standard template provided to the Contractor by the Government, adhere to detailed specifications outlined in ECB No 2006-15, and be documented using the Federal Geographic Data Committee (FGDC) metadata standard.

### 1.3. EQUIPMENT DATA

#### 1.3.1. Real Property Equipment

Provide an Equipment-in-Place list of all installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include the cost of each piece of installed property F.O.B. construction site. For each of the items which is specified herein to be guaranteed for a specified period from the date of acceptance thereof, provide the following information: The name, serial and model number address of equipment supplier, or manufacturer originating the guaranteed item. The Contractor's guarantee to the Government of these items will not be limited by the terms of any manufacturer's guarantee to the Contractor. Furnish the list as one (1) reproducible and three (3) copies thirty (30) calendar days before completion of any segment of the contract work which has an incremental completion date.

#### 1.3.2. Maintenance and Parts Data

Furnish a brochure, catalog cut, parts list, manufacturer's data sheet or other publication showing detailed parts data on all other equipment subject to repair and maintenance procedures not otherwise required in Operations and Maintenance Manuals specified elsewhere in this contract. Distribution of directives shall follow the same requirements as listed in paragraph above.

#### 1.3.3. Construction Specifications

Furnish permanent electronic files of final as-built construction specifications, including modifications thereto, with the as-built drawings.

### 1.4. CONSTRUCTION WARRANTY MANAGEMENT

1.4.1. Prior to the end of the one year warranty, the Government may conduct an infrared roof survey on any project involving a membrane roofing system. This survey will be conducted in accordance with ASTM C1153-90, "Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging". The Contractor shall replace all damaged materials and locate and repair sources of moisture penetration.

## 1.4.2. Management

### 1.4.2.1. Warranty Management Plan

Develop a warranty management plan containing information relevant to the clause **Warranty of Construction** in FAR 52.246-21. Submit the warranty management plan for Government approval at least 30 days before the planned pre-warranty conference. In the event of phased turn-over of the contract, update the Warranty Management Plan as necessary to include latest information required. Include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Submit warranty information made available during the construction phase prior to each monthly pay estimate. Assemble information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. The Contractor, Government, including the Customer Representative shall jointly conduct warranty inspections, 4 months and 9 months, after acceptance. The warranty management plan shall include, but shall not be limited to, the following information:

- (1) Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the contractors, subcontractors, manufacturers or suppliers involved.
- (2) Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.
- (3) A list for each warranted equipment, item, feature of construction or system indicating:
  - (i) Name of item.
  - (ii) Model and serial numbers.
  - (iii) Location where installed.
  - (iv) Name and phone numbers of manufacturers or suppliers.
  - (v) Names, addresses and telephone numbers of sources of spare parts.
  - (vi) Warranties and terms of warranty. Include one-year overall warranty of construction. Indicate those items, which have extended warranties with separate warranty expiration dates.
  - (vii) Cross-reference to warranty certificates as applicable.
  - (viii) Starting point and duration of warranty period.
  - (ix) Summary of maintenance procedures required to continue the warranty in force.
  - (x) Cross-reference to specific pertinent Operation and Maintenance manuals.
  - (xi) Organization, names and phone numbers of persons to call for warranty service.
  - (xii) Typical response time and repair time expected for various warranted equipment.
- (4) The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
- (5) Procedure and status of tagging of all equipment covered by extended warranties.
- (6) Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

## 1.4.3. Performance Bond

1.4.3.1. The Contractor's Performance Bond will remain effective throughout the construction warranty period.

1.4.3.2. In the event the Contractor or his designated representative(s) fails to commence and diligently pursue any work required under this clause, and in a manner pursuant to the requirements thereof, the Government shall have

a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Government shall have the work performed by others, and after completion of the work, may make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

1.4.3.3. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Government will have the right to recoup expenses from the bonding company.

1.4.3.4. Following oral or written notification of required warranty repair work, the Contractor will respond as dictated by para. 1.4.5. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Government to proceed against the Contractor as outlined in the paragraph 1.4.5.5 and/or above.

#### 1.4.4. Pre-Warranty Conference

Prior to contract completion, or completion of any phase or portion of contract to be turned over, and at a time designated by the Contracting Officer, the Contractor shall meet with the Government to develop a mutual understanding with respect to the requirements of this clause. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Government for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of his responsibilities in connection with other portions of this provision.

#### 1.4.5. Contractor's Response to Warranty Service Requirements.

Following Government oral or written notification, which may include authorized installation maintenance personnel, the Contractor shall respond to warranty service requirements in accordance with the "Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and backcharge the construction warranty payment item established.

1.4.5.1. First Priority Code 1 Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

1.4.5.2. Second Priority Code 2 Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

1.4.5.3. Third Priority Code 3 All other work to be initiated within 3 work days and work continuously to completion or relief.

1.4.5.4. The "Warranty Service Priority List" is as follows:

- Code 1 - Air Conditioning System
  - (a) Buildings with computer equipment.
  - (b) Barracks, mess halls (entire building down).
- Code 2 - Air Conditioning Systems
  - (a) Recreational support.
  - (b) Air conditioning leak in part of building, if causing damage.
  - (c) Air conditioning system not cooling properly

- (d) Admin buildings with Automated Data Processing (ADP) equipment not on priority list.
  - Code 1 - Doors
- (a) Overhead doors not operational.
  - Code 1 - Electrical
- (a) Power failure (entire area or any building operational after 1600 hours).
- (b) Traffic control devices.
- (c) Security lights.
- (d) Smoke detectors and fire alarm systems
- (e) Power or lighting failure to an area, facility, portion of a facility, which may adversely impact health, safety, security, or the installation's mission requirement, or which may result in damage to property.
  - Code 2 - Electrical
- (a) Power failure (no power) for unoccupied buildings or portions thereof or branch circuits within occupied buildings, not listed as Code 1.
- (a) Receptacle and lights, not listed as code 1.
  - Code 3 - Electrical
- (a) Street, parking area lights
  - Code 1 - Gas
- (a) Leaks and breaks.
- (b) No gas to cantonment area.
  - Code 1 - Heat
- (a) Area power failure affecting heat.
- (b) Heater in unit not working.
  - Code 2 Heat
- (a) All heating system failures not listed as Code 1.
  - Code 3 - Interior
- (a) Floor damage
- (b) Paint chipping or peeling
  - Code 1 - Intrusion Detection Systems - N/A.
  - Code 2 - Intrusion Detection Systems other than those listed under Code 1
  - Code 1 - Kitchen Equipment
- (a) Dishwasher.
- (b) All other equipment hampering preparation of a meal.
  - Code 2 - Kitchen Equipment
- (a) All other equipment not listed under Code 1.
  - Code 2 - Plumbing
- (a) Flush valves not operating properly
- (b) Fixture drain, supply line commode, or water pipe leaking.
- (c) Commode leaking at base.
  - Code 3 - Plumbing
- (a) Leaking faucets



- Code 1 - Refrigeration
  - (a) Mess Hall.
  - (b) Medical storage.
- Code 2 - Refrigeration
  - (a) Mess hall - other than walk-in refrigerators and freezers.
- Code 1 - Roof Leaks
  - (a) Temporary repairs will be made where major damage to property is occurring.
- Code 2 - Roof Leaks
  - (a) Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.
- Code 1 - Sprinkler System
  - (a) All sprinkler systems, valves, manholes, deluge systems, and air systems to sprinklers.
- Code 1 - Tank Wash Racks (Bird Baths)
  - (a) All systems which prevent tank wash.
- Code 1 - Water (Exterior)
  - (a) Normal operation of water pump station.
- Code 2 - Water (Exterior)
  - (a) No water to facility.
- Code 1 - Water, Hot (and Steam)
  - (a) Barracks (entire building).
- Code 2 - Water, Hot
  - (a) No hot water in portion of building listed under Code 1

1.4.5.5. Should parts be required to complete the work and the parts are not immediately available, the Contractor shall have a maximum of 12 hours after arrival at the job site to provide the Government, with firm written proposals for emergency alternatives and temporary repairs for Government participation with the Contractor to provide emergency relief until the required parts are available on site for the Contractor to perform permanent warranty repair. The Contractor's proposals shall include a firm date and time that the required parts shall be available on site to complete the permanent warranty repair. The Government will evaluate the proposed alternatives and negotiate the alternative considered to be in the best interest of the Government to reduce the impact of the emergency condition. Alternatives considered by the Government will include the alternative for the Contractor to "Do Nothing" while waiting until the required parts are available to perform permanent warranty repair. Negotiating a proposal which will require Government participation and the expenditure of Government funds shall constitute a separate procurement action by the using service.

#### 1.4.6. Equipment Warranty Identification Tags

1.4.6.1. Provide warranty identification tags at the time of installation and prior to substantial completion shall provide warranty identification tags on all Contractor and Government furnished equipment which the Contractor has installed.

- (a) The tags shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Tag each component of contractor furnished equipment that has differing warranties on its components.
- (b) Submit sample tags, representing how the other tags will look, for Government review and approval.
- (c) Tags for Warranted Equipment: The tag for this equipment shall be similar to the following: Exact format and size will be as approved.

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EQUIPMENT WARRANTY - CONTRACTOR FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

CONTRACTOR NAME

CONTRACTOR WARRANTY EXPIRES

MFG WARRANTY(IES) EXPIRE

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EQUIPMENT WARRANTY - GOVERNMENT FURNISHED EQUIPMENT

MFG NAME MODEL NO.

SERIAL NO.

CONTRACT NO.

DATE EQUIP PLACED IN SERVICE

MFG WARRANTY(IES) EXPIRE

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(d) If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag

1.4.6.2. Execution: Complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment.

## 1.5. MECHANICAL TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

Submit; all reports, statements, certificates, and completed checklists for testing, adjusting, balancing, and commissioning of mechanical systems prior to final inspection and transfer of the completed facility for approval, as specified in applicable technical specification sections.

## 1.6. OPERATION AND MAINTENANCE MANUALS

### 1.6.1. General Requirements

1.6.1.1. Inasmuch as the operations and maintenance manuals are required to operate and maintain the facility, the operations and maintenance (O&M) manuals will be considered a requirement prior to substantial completion of any facility to be turned over to the Government. Beneficial occupancy of all or portions of a facility prior to substantial completion will not relieve the Contractor of liquidated damages, if substantial completion exceeds the required completion date.

1.6.1.2. Provide one permanent electronic copy on CD-ROM and 2 hard copies of the Equipment Operating, Maintenance, and Repair Manuals. Provide separate manuals for each utility system as defined hereinafter. Submit Operations and Maintenance manuals for approval before field training or 90 days before substantial completion (whichever occurs earlier). If there is no separate CLIN for O&M Manuals, the Government will withhold an amount representing \$20,000, as non-progressed work, until submittal and approval of all O&M manuals are complete.

### 1.6.2. Definitions

#### 1.6.2.1. Equipment

A single piece of equipment operating alone or in conjunction with other equipment to accomplish a system function.

#### 1.6.2.2. System

A combination of one or more pieces of equipment which function together to accomplish an intended purpose (i.e. HVAC system is composed of many individual pieces of equipment such as fans, motors, compressors, valves, sensors, relays, etc.)

### 1.6.3. Hard Cover Binders

The manuals shall be hard cover with posts, or 3-ring binders, so sheets may be easily substituted. Print the following identification on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUALS," the project name, building number, and an indication of utility or systems covered, the name of the Contractor, and the Contract number. Manuals shall be approximately 8-1/2 by 11-inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for the project must be similar in appearance, and be of professional quality.

### 1.6.4. Warning Page

Provide a warning page to warn of potential dangers (if they exist, such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, high pressures, etc.). Place the warning page inside the front cover and in front of the title page. Include any necessary Material Safety Data Sheets (MSDS) here.

### 1.6.5. Title Page

The title page shall include the same information shown on the cover and show the name of the preparing firm and the date of publication.

#### 1.6.6. Table of Contents

Each volume of the set of manuals for this project shall include a table of contents, for the entire set, broken down by volume.

#### 1.6.7. GENERAL

Organize manuals according to the following format, and include information for each item of equipment. Submit a draft outline and table of contents for approval at 50% contract completion.

#### TABLE OF CONTENTS

##### PART I: Introduction

- Equipment Description
- Functional Description
- Installation Description

##### PART II: Operating Principles

##### PART III: Safety

##### PART IV: Preventive Maintenance

- Preventive Maintenance Checklist, Lubrication
- Charts and Diagrams

##### PART V: Spare Parts Lists

- Troubleshooting Guide
- Adjustments
- Common Repairs and Parts Replacement

##### PART VI: Illustrations

#### 1.6.7.1. Part I-Introduction

Part I shall provide an introduction, equipment or system description, functional description and theory of operation, and installation instructions for each piece of equipment. Include complete instructions for uncrating, assembly, connection to the power source and pre-operating lubrication in the installation instructions as applicable. Illustrations, including wiring and cabling diagrams, are required as appropriate in this section. Include halftone pictures of the equipment in the introduction and equipment description, as well as system layout drawings with each item of equipment located and marked. Do not use copies of previously submitted shop drawings in these manuals.

#### 1.6.7.2. Part II-Operating Principles

Part II shall provide complete instructions for operating the system, and each piece of equipment. Illustrations, halftone pictures, tables, charts, procedures, and diagrams are required when applicable. This will include step-by-step procedures for start-up and shutdown of both the system and each component piece of equipments, as well as adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions. Show performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates here, also. Marked-up catalogs or catalog pages do not satisfy this requirement. Present performance information as concisely as possible with only data pertaining to equipment actually installed. Include actual test data collected for Contractor performance here.

#### 1.6.7.3. Part III-Safety

Part III shall contain the general and specific safety requirements peculiar to each item of equipment. Repeat safety information as notes cautions and warnings in other sections where appropriate to operations described.

#### 1.6.7.4. Part IV-Preventive Maintenance

Part IV shall contain a troubleshooting guide, including detailed instructions for all common adjustments and alignment procedures, including a detailed maintenance schedule. Also include a diagnostic chart showing symptoms and solutions to problems. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings. Include instructions for the removal, disassembly, repair, reassembly, and replacement of parts and assemblies where applicable and the task is not obvious.

#### 1.6.7.5. Part V-Spare Parts List

Part V shall contain a tabulation of description data and parts location illustrations for all mechanical and electrical parts. The heading of the parts list shall clearly identify the supplier, purchase order number, and equipment. Include the unit price for each part. List parts by major assemblies, and arrange the listing in columnar form. Include names and addresses of the nearest manufacturer's representatives, as well as any special warranty information. Provide a list of spare parts that are recommended to be kept in stock by the Government installation.

#### 1.6.7.6. Part VI-Illustrations

Part VI shall contain assembly drawings for the complete equipment or system and for all major components. Include complete wiring diagrams and schematics. Other illustrations, such as exploded views, block diagrams, and cutaway drawings, are required as appropriate.

#### 1.6.8. Framed Instructions

Post framed instructions are required for substantial completion. Post framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, including equipment, ductwork, piping valves, dampers, and control sequence at a location near the equipment described. Prepare condensed operating instructions explaining preventive maintenance procedures methods of checking the system for normal safe operation, valve schedule and procedures for safely starting and stopping the system in type form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Submit proposed diagrams, instructions, and other sheets prior to posting. Post the framed instructions before field training.

#### 1.6.9. (Reserved. See 1.7 for Field Training)

#### 1.6.10. System/Equipment Requirements

##### 1.6.10.1. Facility Heating System

Provide information on the following equipment: boilers, water treatment, chemical feed pumps and tanks, converters, heat exchangers, pumps, unit heaters, fin-tube radiation, air handling units (both heating only and heating and cooling), and valves (associated with heating systems).

##### 1.6.10.2. Air-Conditioning Systems

Provide information in chillers, packaged air-conditioning equipment, towers, water treatment, chemical feed pumps and tanks, air-cooled condensers, pumps, compressors, air handling units, and valves (associated with air-conditioning systems).

##### 1.6.10.3. Temperature Control and HVAC Distribution Systems

Provide all information described for the following equipment: valves, fans, air handling units, pumps, boilers, converters and heat exchangers, chillers, water cooled condensers, cooling towers, and fin-tube radiation, control air compressors, control components (sensors, controllers, adapters and actuators), and flow measuring equipment.

#### 1.6.10.4. Central Heating Plants

Provide the information described for the following equipment: boilers, converters, heat exchangers, pumps, fans, steam traps, pollution control equipment, chemical feed equipment, control systems, fuel handling equipment, de-aerators, tanks (flash, expansion, return waters, etc.), water softeners, and valves.

#### 1.6.10.5. Heating Distribution Systems

Provide the information described for the following equipment: valves, fans, pumps, converters and heat exchangers, steam traps, tanks (expansion, flash, etc.), and piping systems.

#### 1.6.10.6. Exterior Electrical Systems

Provide information on the following equipment: power transformers, relays, reclosers, breakers, and capacitor bank controls.

#### 1.6.10.7. Interior Electrical Systems

Provide information on the following equipment: relays, motor control centers, switchgear, solid state circuit breakers, motor controller, EPS lighting systems, wiring diagrams and troubleshooting flow chart on control systems, and special grounding systems.

#### 1.6.10.8. Energy Monitoring and Control Systems

The maintenance manual shall include descriptions of maintenance for all equipment, including inspection, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components.

#### 1.6.10.9. Domestic Water Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentation, laboratory test equipment, chemical feeders, valves, switching gear, and automatic controls.

#### 1.6.10.10. Wastewater Treatment Systems

Provide the identified information on the following equipment: tanks, unit process equipment, pumps, motors, control and monitoring instrumentations, laboratory test equipment chemical feeders, valves, scrapers, skimmers, comminutors, blowers, switching gear, and automatic controls.

#### 1.6.10.11. Fire Protection Systems

Provide information on the following equipment: alarm valves, manual valves, regulators, foam and gas storage tanks, piping materials, sprinkler heads, nozzles, pumps, and pump drivers.

#### 1.6.10.12. Fire Alarm and Detection Systems

- (1) The maintenance manual shall include description of maintenance for all equipment, including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
- (2) Provide all software; database with complete identification of programmable portions of system equipment and devices, and all other system programming data on all modes of the system; connecting cables; and proprietary equipment necessary for the operation, maintenance, testing, repair and programming, etc. of the system and that may be required for implementation of future changes to the fire system (additional and/or relocated initiating devices, notification devices, etc.
- (3) Provide all system and equipment technical data and computer software with the requisite rights to Government use, in accordance with the applicable contract clauses.
- (4) Training shall include software and programming required for the effective operation, maintenance, testing, diagnostics and expansion of the system.

#### 1.6.10.13. Plumbing Systems

Provide information on the following equipment: water heaters, valves, pressure regulators backflow preventors, piping materials, and plumbing fixtures.

#### 1.6.10.14. Liquid Fuels Systems

Provide information on the following equipment: tanks, automatic valves manual valves, filter separators, pumps, mechanical loading arms, nozzles, meters, electronic controls, electrical switch gear, and fluidic controls.

#### 1.6.10.15. Cathodic Protection Systems

Provide information on the following material and equipment: rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

#### 1.6.10.16. Generator Installations

Provide information on the following equipment: generator sets, automatic transfer panels, governors, exciters, regulators starting systems, switchgear, and protective devices.

#### 1.6.10.17. Miscellaneous Systems

Provide information on the following: communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, nurse call, paging, intercom, closed circuit TV, irrigation, sound and material delivery systems, kitchen, refrigeration, disposal, ice making equipment, and other similar type special systems not otherwise specified.

#### 1.6.10.18. Laboratory, Environmental and Pollution Control Systems

Provide information on the following equipment: wet scrubbers, quench chambers, scrub tanks, liquid oil separators, and fume hoods.

### 1.7. FIELD TRAINING

Field Training is a requirement for substantial completion. Conduct a training course for the operating staff for each particular system. Conduct the training is to be conducted during hours of normal working time after the system is functionally complete. The field instructions shall cover all of the items contained in the Equipment Operating, Maintenance and Repair Manuals. The training will include both classroom and "hands-on" training. Submit a lesson plan outlining the information to be discussed during training periods. Submit this lesson plan for approval 90 days before contract completion before the field training occurs. Record training on DVD and furnish to the Government within ten (10) days following training. Document all training and furnish a list of all attendees.

### 1.8. PRICING OF CONTRACTOR-FURNISHED AND INSTALLED PROPERTY AND GOVERNMENT-FURNISHED CONTRACTOR-INSTALLED PROPERTY

Promptly furnish and require any sub-contractor or supplier to furnish, in like manner, unit prices and descriptive data required by the Government for Property Record purposes of fixtures and equipment furnished and/or installed by the Contractor or sub-contractor, except prices do not need to be provided for Government-Furnished Property.

### 1.9. LEED REVIEW MEETINGS

1.9.1. Pre-Closeout Meeting. Approximately 30 days before submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the documentation, determine which, if any, credits will be audited and identify any corrections/missing items prior to the closeout LEED documentation submittal.

1.9.2. Approximately 14 days after submittal of LEED closeout documentation, the Contractor and the Government's project delivery team (including Installation representative) will meet to review the LEED closeout

documentation. The review conference will include discussion of and resolution of all review comments to ensure consensus on achievement of credits and satisfactory documentation. At the review conference a final score will be determined and endorsed in writing by all parties.

#### 1.10. RED ZONE MEETING

At approximately 80% of contract completion or 60 days before the anticipated Beneficial Occupancy Date (BOD), whichever occurs first, the Contractor and the Government's project delivery team will conduct what is known as the Red Zone Meeting to discuss the close-out process, to schedule the events and review responsibilities for actions necessary to produce a timely physical, as well as fiscal, project close-out. The Red Zone meeting derives its name from the football term used to describe the team effort to move the ball the last 20 yards into the end zone. The close-out of a construction project sometimes can be equally as hard and most definitely requires the whole team's efforts. The ACO will chair the meeting. If not already provided, shortly before the meeting, the Contractor shall provide an electronic copy or access to the CADD as-built drawings, completed commensurate with the amount of work completed at the time of the Red Zone Meeting, as an indicator of the Contractors' understanding of and ability to meet the USACE CADD Standards and to ensure that the Contractor is making progress with CADD As-Built requirements. EXHIBIT 1 is a generic meeting checklist.

#### 1.11. FINAL CLEANING

Clean the premises in accordance with FAR clause 52.236-12 and additional requirements stated here. Remove stains, foreign substances, and temporary labels from surfaces. Vacuum carpet and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean or replace filters of operating equipment if cleaning isn't possible or practicable. Remove debris from roofs, drainage systems, gutters, and downspouts. Sweep paved areas and rake clean landscaped areas. Remove waste, surplus materials, and rubbish from the site. Remove all temporary structures, barricades, project signs, fences and construction facilities. Submit a list of completed clean-up items on the day of final inspection.

#### 1.12. INTERIM FORM DD1354 "TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY

Near the completion of Project, but a minimum of 60 days prior to final acceptance of the work, complete, update draft provided with the final design package(s) (see Section 01 33 16, paragraph 3.7.5) and submit an accounting of all installed property on Interim Form DD1354 "Transfer and Acceptance of Military Real Property." Include any additional assets/improvements/alterations and cost updates from the Draft DD Form 1354. Contact the COR for any project specific information necessary to complete the DD Form 1354. This form will be a topic for the Red Zone Meeting discussed above. For information purposes, a blank DD Form 1354 (fill-able) in ADOBE (PDF) may be obtained at the following web site: <http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd1354.pdf> Submit the completed Checklist for Form DD1354 of Government-Furnished and Contractor-Furnished/Contractor Installed items. Attach this list to the updated DD Form 1354. Instructions for completing the form and a blank checklist (fill-able) in ADOBE (PDF) may be obtained at the following web site: [http://www.wbdg.org/ccb/DOD/UFC/ufc\\_1\\_300\\_08.pdf](http://www.wbdg.org/ccb/DOD/UFC/ufc_1_300_08.pdf)



## EXHIBIT 1

**SAMPLE**

## Red Zone Meeting Checklist

Date: \_\_\_\_\_

<b>Contract No.</b>			
<b>Description / Location</b>			
<b>Contractor</b>			
<b>Contracting Officer</b>			
<b>Action</b>	<b>Completion Milestone</b>	<b>√</b>	
Inspections			
Fire			
Safety			
Pre-final			
Mechanical Test & Balance			
Commissioning			
Landscaping Complete			
Erosion Control			
Beneficial Occupancy Date (BOD)			
Furniture Installation			
Comm Installation			
As-Built Drawings			
Provide all O&M manuals, tools, shop drawings, spare parts, etc. to customer			
Training of O&M Personnel			
Provide Warranty documents to Customer			
Contract completion			
Final Inspection			
User move-in			
DD Form 1354, Transfer of Real Property completed & signed			

Friday, May 27, 2011

Ribbon cutting		
Payroll Clearances		
DD Form 2626 - Construction Contractor Performance Evaluation		
DD Form 2631 – A-E Performance Rated after Construction		
Status of Pending Mods and REA's/Claims		
Final Payment Completed		
Release of Claims		
Return of Unobligated Funds		
Move Project from CIP to General Ledger		
Financial completion		

End of Section 01 78 02.00 10

# APPENDIX

## A

# Geotechnical Engineering Report

**Training Support Center (W912HN-10-D-0019)**

**Washington Road**

**Ft. Jackson, South Carolina**

August 23, 2010

Terracon Project No. 73105046

**Prepared for:**

SEPI Engineering and Construction

Charlotte, North Carolina

**Prepared by:**

Terracon Consultants, Inc.

Columbia, South Carolina

Offices Nationwide  
Employee-Owned

Established in 1965  
[terracon.com](http://terracon.com)

# Terracon



August 23, 2010

SEPI Engineering and Construction  
7506 East Independence Boulevard  
Charlotte, North Carolina 28227

Attn: Mr. Kelly Hayes

Re: Geotechnical Engineering Report  
Training Support Center (W912HN-10-D-0019)  
Washington Road  
Ft. Jackson, South Carolina  
Terracon Project No. 73105046

Dear Mr. Hayes:

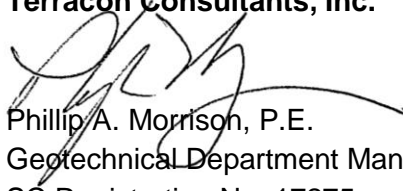
Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our Proposal No. P73090128, dated May 27, 2010.

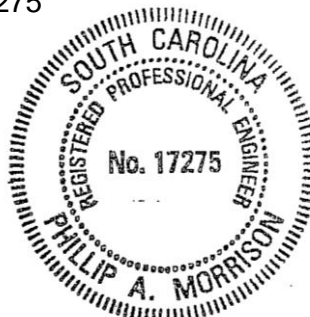
This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. Materials testing services are provided by Terracon. We would be pleased to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.


Sincerely,

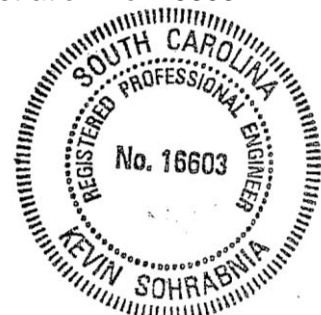
**Terracon Consultants, Inc.**

  
Phillip A. Morrison, P.E.  
Geotechnical Department Manager  
SC Registration No. 17275



Attachments  
3xc: Above  
1xc: File

  
Kevin Sohrabnia, P.E.  
Senior Principal  
SC Registration No. 16603



Terracon Consultants, Inc. 521 Clemson Road Columbia, South Carolina 29229

P [803] 741 9000 F [803] 741 9900 [terracon.com](http://terracon.com)

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### APPENDIX A – FIELD EXPLORATION

Field Testing Description  
 Figure 1 - Site Location Map  
 Figure 2 – Field Testing Location Plan  
 Figure 3 – Shear Wave Velocity Profile  
 Boring Logs

### APPENDIX B – LABORATORY TESTING

Laboratory Testing Description  
 Summary of Laboratory Data  
 Laboratory Data Sheets

### APPENDIX C – SUPPORTING DOCUMENTS

General Notes  
 Unified Soil Classification System

# GEOTECHNICAL EXPLORATION REPORT TRAINING SUPPORT CENTER (W912HN-10-D-0019) FT. JACKSON, SOUTH CAROLINA

Terracon Project No. 73105046

August 23, 2010

## 1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the Training Support Center to be located on Washington Street on Ft. Jackson near Columbia, South Carolina. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- earthwork
- seismic site class
- groundwater conditions
- foundation design and construction
- floor slab design and construction

Our geotechnical engineering scope of work for this project included the advancement of eight soil test borings to a depth of approximately 40 feet below existing site grades and geophysical testing to develop the shear wave velocity profile.

The boring logs, the shear wave velocity profile, the Site Location Map and the Boring Location Plan are included in Appendix A of this report. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included in Appendix B of this report. Descriptions of the field exploration and laboratory testing are included in their respective appendices.

## 2.0 PROJECT DESCRIPTION

### 2.1 Project Description

ITEM	DESCRIPTION
Site layout	Not provided. The building is presumed to be centrally located on the property.
Structures	The project will include a one-story building with a proposed footprint of approximately 93,000 square feet.
Building construction	Steel framed building with CMU block walls, brick veneer, and a standing seam metal roof.
Finished floor elevation	Not provided. It is presumed to be at or near the existing ground surface.

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ITEM	DESCRIPTION
<b>Maximum loads</b>	Columns: 75 kips (assumed) Walls: 2 klf (assumed) Slabs: 150 psf max (assumed)
<b>Maximum allowable settlement</b>	Columns: 1-inch (assumed) Walls: ¾ inch over 40 feet (assumed)
<b>Grading</b>	Less than 3 feet of cut and fill (assumed)
<b>Cut and fill slopes</b>	Assumed to be no steeper than 3H:1V (Horizontal to Vertical)
<b>Free-standing retaining walls</b>	None
<b>Below Grade Areas</b>	None

**2.2 Site Location and Description**

ITEM	DESCRIPTION
<b>Location</b>	This project will be located on Ft. Jackson near Columbia, South Carolina. The 8±-acre site is on the south side of Washington Road and further bounded by Hall Street and Foster Street.
<b>Existing improvements</b>	<p>Currently, there is little in the way of existing improvements. There is a large horizontal LP gas tank on the site's south side. The remaining portions of the site are wooded pine forest with some open grass areas along Washington Road. Remnants of a railroad line cross the center of the site from east to west. Further, pavements are present along the north side of the site and at the southwest corner. These are coupled with several small diameter culvert crossings, primarily along Washington Road and Foster Street.</p> <p>A number of underground utilities (water, gas, sewer, and storm drain) are present throughout the site. This also includes a fire hydrant near the center of the wooded area. Overhead power lines also crisscross the site.</p> <p>Prior to 2000, there was a moderate-size building associated with the existing pavement at the southwest site corner. Prior to 1996, the majority of the site was covered by a large structure. Poor quality aerial photography from 1959 indicates its presence. It covered the majority of the site's southeast quadrant. Two smaller buildings were present along Washington Street at the time. All of the noted structures have been razed.</p>
<b>Current ground cover</b>	The majority of the site is wooded with small to moderate sized pines with a wide grass buffer along the Washington Road frontage.



ITEM	DESCRIPTION
Existing topography	Relatively flat. There is a gradual slope downward to the southeast. According to the topography provided by our client, the surface elevations range from 203 feet on the northwest side to 192 feet at the east corner.

### 3.0 SUBSURFACE CONDITIONS

#### 3.1 Geology

The site is located in the upper Coastal Plain physiographic province of South Carolina, near the Fall Line (the transition from the Coastal Plain to the Piedmont province). The Coastal Plain is a wedge-shaped cross section of water and wind deposited soil. Its thickness ranges from a featheredge at the surface contact of the Piedmont to several thousand feet at the present day coastline. The sediments range in age from the Cretaceous and Tertiary periods at the contact with the bedrock to the Recent period at the present coastline. The sediments include clays, silts, sands, and gravels, as well as organics.

The underlying Piedmont physiographic province consists of soils generated by the in-place chemical and mechanical weathering of the parent sedimentary and metamorphic rock. A common soil profile includes a surficial clayey or silty layer transitioning to coarser material at depth. Generally dividing the soil layer from the bedrock is a very dense layer referred to as "*partially weathered rock*". Partially weathered rock is composed of irregular zones of very dense soil and rock. Partially weathered rock exhibits standard penetration test values of 100 blows per foot (bpf) or more.

The topography of the underlying bedrock surface and the thickness of the various soil and weathered rock strata vary greatly in short, horizontal distances because of variation in mineralogy of the material, previous and present groundwater conditions, and past tectonic activity (faulting, folding, intrusions, etc.). Further, the presence of boulders and rock pinnacles is possible within the soil matrix.

Alluvial soils are those deposited by the water erosion of nearby areas. These soils are generally loose or soft and may contain a high concentration of organics. They are considered geologically recent deposits.

Fill soils are those soils that have been placed or reworked in conjunction with past construction grading or farming. Fill can be composed of different soil types from various sources and can contain debris from building demolition, organics, topsoil, trash, etc. The engineering properties of the fill depend primarily on its composition, density, and moisture content.

### 3.2 Typical Subsurface Profile

Specific conditions encountered at each boring location are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the borings can be found on the boring logs included in Appendix A of this report. Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency/Density
Stratum 1A	3 to 5-½ Borings B-1 to B-3	Sand with silt and clay	Loose to Medium Dense
Stratum 1B	8 to 12 Boring B-5	Alluvium – clayey sand with organics	Very loose to loose
Stratum 1C	3 to 5-1/2 Borings B-4, B-6 and B-7	Fill - Clayey sand	Very loose to loose
Stratum 2	40 (Termination depths of the borings)	Silty sand and sandy silt	Medium dense to very dense/very stiff to hard

### 3.3 Groundwater Conditions

Groundwater was encountered at depths of 7 to 10 feet in the test borings after 24 hours. The exception is Boring B-8 where no groundwater was encountered. These observations represent groundwater conditions at the time of the field exploration, and may not be indicative of other times, or at other locations. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

## 4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

### 4.1 Geotechnical Considerations

The site soil conditions in the upper 5 to 12 feet of the eight soil test borings were variable, ranging from loose to medium dense sand in the western portion of the site to existing fill consisting of very loose to loose clayey sand in the eastern portion. Set between these areas, one boring (Boring B-5) encountered deep, very loose, alluvial clayey sand with some organics. Moderately shallow groundwater, ranging in depth from 7 to 10 feet below the ground surface at the borings, is present at the site.

The fill and alluvial soils, located in the central and eastern portions of the site (Borings B-4, B-5, B-6, and B-7), are not suited for direct support of the proposed large, one-story building. Boring B-4, B-6, and B-7 were underlain by low consistency native clayey sand. Using data from a consolidation test performed on a sample of the clayey sand, we have estimated a total settlement of about 1-1/4 to 1-1/2 inches under the noted structural loads. This is likely beyond the range of tolerable settlement for a masonry structure such as that planned for this site.

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Current development plans include the construction of a 2+-acre building on the 7±-acre site, though its location on the site has not been determined. Presuming a generally rectangular sized building, it will be difficult to site the building without the development being impacted by the alluvial soils or the existing fill. The numerous underground utilities will similarly impact the construction activities as these materials should be removed and replaced to prepare the site for building construction. Repair of both conditions will be impeded by the groundwater.

There is a risk associated with constructing a building over areas containing alluvium and undocumented existing fill, such as an elevated potential post-construction settlement which can result in cracking of the walls and slabs-on-grade. Without knowing the actual location of the structure, it is not practical to discuss methods of site remediation beyond removal and replacement of the alluvium and the existing fill. The following recommendations are tailored to that end.

In the development's pavement areas, the existing fill can likely be left in place. Its subgrade should be proofrolled and any yielding areas should be repaired to create a uniformly stable subgrade to place any additional fill and the pavement system. The proofrolling and repair activities should be performed under the supervision of the geotechnical engineer or his representative.

Once the actual building and pavement locations are determined, we recommend that a supplemental geotechnical exploration be performed to better quantify the extent to which these conditions will impact the structure and pavements. This would aid in determining whether all or only a portion of the existing fill/alluvium must be removed, whether the existing fill can remain in the floor slab and removed only from the footing area, or whether a ground improvement method (stone columns, preloading, etc.) can be used to improve the soil support conditions. All of these options would likely lessen the development costs and speed construction.

Within this report, we discuss our recommendations for the proper handling of these issues, as well as for site grading, the design and construction of the foundations and slabs-on-grade.

## **4.2 Earthwork**

The following presents recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations and slabs are contingent upon following the recommendations outlined in this section. All grading for each structure should incorporate the limits of the proposed structure plus a minimum pad blow-up of five feet beyond proposed perimeter building walls and any exterior columns.

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Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

**4.2.1 Site Preparation**

We anticipate construction will be initiated by stripping vegetation, and loose, soft or otherwise unsuitable material. Stripped materials consisting of vegetation and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations. Stripping depths between our boring locations and across the site could vary considerably. As such, we recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material.

Demolition of the existing development should include complete removal of the asphalt pavements, foundations and any other remnants of development within the proposed construction area. This should include removal of any loose backfill found adjacent to existing foundations and over underground utilities. All materials derived from the demolition of existing pavements should be removed from the site and not be allowed for use in any on-site structural fills. Any stone base course below the pavements should also be removed to expose the underlying soils to allow better observation of the subgrade during proofrolling. The stone base material can be reused as structural fill; however, we do not recommend incorporating the material into the planned pavement system due to its likely contamination by the underlying soil.

Special precautions should be made to remove all underground utilities and their associated backfill as the new building's foundations and floor slabs may overlay these materials. Care should be given to locating and addressing these items during the site preparation phase of the project. If overlooked, they could be detrimental to the long-term performance of the building or pavements. There are several existing sanitary sewer, gas and water lines that crisscross the site. Information regarding the invert depths is limited, but the survey plan does indicate depths of 7 to 12 feet on the east side of the site.

**4.2.2 Subgrade Preparation (Building Area)**

We recommend the existing fill and soft alluvium be removed from the building area. Based on the boring data and depending on the building location, this depth could range from 5-½ feet to 12 feet. The deepest excavation is currently associated with the very loose alluvium found in Boring B-5. We recommend that the undercutting extend at least 10 feet beyond the outside the building footprint. The sidewalls of the undercut area should be sloped to maintain their stability. The extent of the undercut area cannot be estimated without benefit of the building location. Once the building area is defined, additional exploration is warranted

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**Terracon**

to estimate the expanse of the alluvium and existing fill and provide a better depiction of its composition.

The purpose of undercutting activities is to remove the existing fill and alluvium. As the existing fill's presence may have caused some degradation of the native soils, some subgrade repairs may be necessary to allow the fill soils to be compacted on the exposed subgrade to the desired compaction level. Subgrade repairs may include compaction of the exposed subgrade or selective undercutting and replacement. The necessity of the subgrade repairs should be determined by the geotechnical engineer or his representative at the time of excavation.

There is a high probability that wet conditions will be present at the base of the existing fill and alluvium. Such conditions, though firm, may not be adequately stable to place and compact the structural fill directly on the exposed subgrade. Depending on condition of the exposed soils and the type of fill planned for use as backfill, it may be necessary to cover the subgrade with a medium gauge geo-grid to facilitate direct fill placement. For this application, we recommend the use of Tensar BX1100 or equal due to its high modulus value. Other materials can be considered, however they should be equivalent to the Tensar material. The material should extend throughout the undercut subgrade.

Presuming only wet soil conditions are exposed, the fill placement can commence using free draining, fine to coarse sand. A minimum of three feet of these materials should be placed. These materials can be compacted in moderately wet conditions when stabilized by the noted grid. The materials placed in the shallower fill zone should conform to the recommendations in Section 4.2.4 of this report. Depending on the grading schedule, there is a potential that some of the excavated fill can be reused to backfill the area. As some of the collected samples contained organics and the deeper portions of the fill were wet, the extent of the usable fill is not known. We recommend that our personnel observe the undercut operations and aid in the segregation of the fill during excavation. This too can be better estimated within the scope of the supplemental exploration.

If groundwater is encountered in the undercut excavation, temporary dewatering can likely be accomplished by sloping the exposed subgrade to the perimeter and removing the water with submersible pumps. To limit the amount of dewatering and to maintain the stability of subgrades, we recommend that the final 3 feet of the undercutting be performed in a rapid manner. Adequate clean sand fill, as noted above, should be stockpiled on site to rapidly place these materials on the grid. The undercutting operations should be monitored by a qualified geotechnical engineer or his representative to check that the subgrades are undercut as recommended. The undercut depth may vary, depending upon the actual site conditions at the time of construction. Some dewatering may be needed and should be considered in the project budget.

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**4.2.3 Subgrade Preparation (Paved Area)**

After stripping, the exposed subgrades in the at-grade areas and areas receiving fill should be proofrolled. Cut areas should be proofrolled after they have been excavated to their proposed subgrade levels. This is important given that existing fill is present at various areas across the site. Proofrolling should be performed with a heavily loaded tandem axle dump truck or with similar approved construction equipment under the observation of the geotechnical engineer. If conditions are found to be unstable, the subgrade should be undercut to soils that would provide a firm base for the compaction of the structural fill. The undercut soils should be replaced with compacted structural fill, placed as described in the "Earthwork" section of this report. Mass fill placement may commence after proofrolling has been successfully completed. Given the consistency of the existing fill in the borings, it should be expected that some unstable areas will be found that will require undercutting and replacement. This should be considered in both the project budget and schedule.

In addition to proofrolling the general subgrade, the areas containing existing fill should be further evaluated. The evaluation should include excavating test pits to observe the composition of the fill. The actual scope of the evaluation should be determined in the field by the geotechnical engineer, depending on the location of the fill relative to the development plan. In the proposed building area, we recommend that the entire existing fill be removed and replaced with structural fill as discussed in Section 4.2.3.

**4.2.4 Material Types**

Engineered fill should meet the following material property requirements:

Fill Type <sup>1</sup>	USCS Classification	Acceptable Location for Placement
Clean well graded sand	SW, GW	All locations and elevations Required in the initial 3 feet of the undercut areas
Well graded sands	SW, SC and SM	All locations and elevations. SC and SM not recommended in the initial 3 feet of the undercut areas
Clays and silts	CL, CH, ML and MH	Not recommended for use as structural fill
On-Site Soils	Varies	It is not expected that fill soils will be generated beyond the undercut soils. These soils range from clayey sand to silt with organics. It is possible that some materials can be reused, if dried so that their moisture contents are near various materials' optimum value. These soils should not be used in the initial 3 feet of the undercut areas.

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for evaluation.



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#### 4.2.5 Compaction Requirements

ITEM	DESCRIPTION
<b>Fill Lift Thickness</b>	9-inches or less in loose thickness <sup>3</sup>
<b>Compaction Requirements</b> <sup>1</sup>	95% of the material's maximum standard Proctor dry density (ASTM D 698) <sup>3</sup>
<b>Moisture Content Granular Material</b> <sup>2</sup>	Workable moisture levels

1. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.
3. The thickness of the initial fill lift in the undercut area should be determined by the geotechnical engineer in the field but will likely be on the order of 18 inches. It should be compacted to the highest level without causing it to become unstable.

#### 4.2.6 Excavation

The boring data indicate that the site soils should generally be excavatable using conventional construction equipment. Trenches and other shallow excavations can be performed using medium to large, rubber-tired backhoes. Large trackhoes will be necessary for the deeper excavations, such as for undercutting and existing utility line removal, generally due to the mass required to be removed.

Groundwater was encountered in the borings at depths of 7 to 10 feet below the existing ground surface. Wet soil conditions should be expected at shallower depths.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Health and Safety Administration (OSHA) regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

Construction site safety is the sole responsibility of the contractor who controls the means, methods and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

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**4.2.7 Construction Considerations**

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of the floor slabs. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proofrolling; placement and compaction of controlled compacted fills; backfilling of excavations into the completed subgrade, and just prior to construction of building floor slabs.

**4.3 Foundation Systems****4.3.1 Design Recommendations**

DESCRIPTION	<u>Column</u>	<u>Wall</u>
<b>Net allowable bearing pressure</b> <sup>1</sup>	2,000 psf	2,000 psf
<b>Minimum dimensions</b>	30 inches	18 inches
<b>Minimum embedment below finished grade for frost protection</b> <sup>2</sup>	18 inches	18 inches
<b>Approximate total settlement</b>	<1 inch	<1 inch
<b>Estimated differential settlement</b>	< $\frac{3}{4}$ inch between columns	< $\frac{3}{4}$ inch over 40 feet
<b>Equivalent unit weight for passive resistance</b> <sup>3</sup>	300 pcf	
<b>Coefficient of sliding friction</b> <sup>3</sup>	0.35	

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes the site will be prepared as indicated in the Earthwork section of this report and any remaining unsuitable fill or soft soils, if encountered during footing construction, will be undercut and replaced with engineered fill.
2. And as a bearing capacity requirement.
3. The sides of the excavation for the spread footing foundation must be nearly vertical and the concrete should be placed neat against these vertical faces for the passive earth pressure values to be valid. If the loaded side is sloped or benched, and then backfilled, the allowable passive pressure will be significantly reduced. Passive resistance in the upper 3 feet of the soil profile should be neglected. If passive resistance is used to resist lateral loads, the base friction should be neglected.



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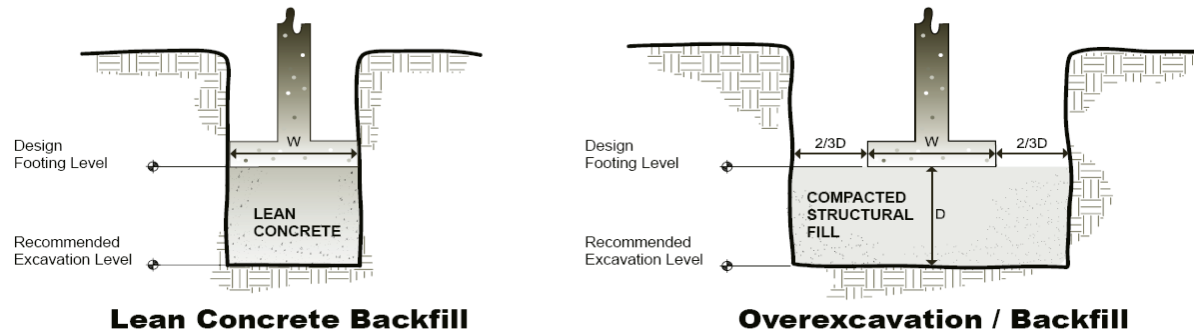
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**Terracon****4.3.2 Construction Recommendations**

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. If the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete. Place a lean concrete mud-mat over the bearing soils if the excavations must remain open over night or for an extended period of time. It is recommended that the geotechnical engineer be retained to observe and test the soil foundation bearing materials.

If unsuitable bearing soils are encountered in footing excavations, the excavations should be extended deeper to suitable soils and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The footings could also bear on properly compacted backfill extending down to the suitable soils. Overexcavation for compacted backfill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. The overexcavation should then be backfilled up to the footing base elevation with well-graded granular material placed in lifts of 9 inches or less in loose thickness and compacted to at least 95 percent of the material's maximum standard effort maximum dry density (ASTM D 698).



NOTE: Excavations in sketches shown vertical for convenience. Excavations should be sloped as necessary for safety.

**4.4 Site Seismic Coefficient**

Code Used	Site Classification
2006 International Building Code (IBC) <sup>1</sup>	C <sup>2</sup>

1. In general accordance with the 2006 International Building Code, Table 1613.5.2. IBC Site Class is based on the characteristics of the upper 100 feet of the subsurface profile.
2. Terracon used a seismic refraction system (SRS) consisting of a seismograph and 24 geophones to perform a site-specific seismic class survey. A linear array of 24 geophones was placed in an accessible area as illustrated in the Boring Location Plan, Figure 2 in Appendix A. A computer was used to record refraction microtremors produced by ambient seismic noise. The data was then processed using a wavefield-transformation data-processing technique and an interactive Rayleigh-wave dispersion-modeling tool. The refraction microtremor (ReMi) method exploits

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aspects of spectral analysis of surface waves (SASW) and multi-channel analysis of surface waves (MASW) to derive a shear wave profile and an average shear-wave velocity along the array for a corresponding depth of about 100 feet. An average shear wave velocity of 2,050 ft/s was derived from our seismic survey data.

**4.5 Floor Slabs****4.5.1 Design Recommendations**

DESCRIPTION	VALUE
<b>Interior building floor system</b>	Slab-on-grade concrete.
<b>Floor slab support</b>	Minimum 12 inches of approved on-site or imported soils placed and compacted in accordance with Earthwork section of this report.
<b>Subbase</b>	4-inch compacted layer of free draining, granular subbase material

A subgrade prepared and tested as recommended in this report should provide adequate support for lightly loaded floor slabs. Slab construction can begin after the completion of any necessary undercutting or in-place stabilization. We recommend that floor slabs be designed as "floating" slabs, that is, fully ground supported and structurally independent of any building footings or walls. This is to aid in minimizing the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation. Narrower, turned-down slab-on-grade foundations may be utilized at the approval of the structural engineer. The slabs should be appropriately reinforced to support the proposed loads.

Control joints should be saw cut into the slab after concrete placement in accordance with ACI Design Manual, Section 302.1R-37 8.3.12 (tooled control joints are not recommended). Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement. Interior trench backfill placed beneath slabs should be compacted in accordance with recommendations outlined in the Earthwork section of this report. Other design and construction considerations, as outlined in the ACI Design Manual Section 302.1R, are recommended.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

**4.5.2 Construction Considerations**

We recommend the area underlying the floor slab be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and placement of base rock. Particular attention should be paid to high traffic areas that were rutted and disturbed

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Training Support Center ■ Ft. Jackson, SC

August 23, 2010 ■ Terracon Project No. 73105046



earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. All floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the base rock and concrete.

On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the floor slab subgrade may not be suitable for placement of base rock and concrete and corrective action will be required to repair the damaged areas.

## **5.0 GENERAL COMMENTS**

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

**APPENDIX A**  
**FIELD EXPLORATION**

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**Field Exploration Description**

After obtaining the digging permit and the REC/MOEC permits from the base personnel on July 28, 2010, the field exploration was initiated. The borings were located in the field by using the provided boring layout plan and measuring from existing property boundaries with adjustments to avoid the existing utilities and limit the need for clearing. The accuracy of boring locations should only be assumed to the level implied by the method used. Once the boring locations were finalized, the areas were checked by a private utility locator for the presence of underground utilities.

A total of eight test borings were drilled at the site between July 29 and 31, 2010. The borings were drilled to a depth of about 40 feet below the ground surface at the approximate locations shown on the attached Boring Location Plan, Figure 2. The test borings were advanced with an ATV-mounted CME-550x drill rig utilizing 2-¼-inch diameter hollow-stem augers.

Continuous lithologic logs of each boring were recorded by the field engineer during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving split-spoon or pushing Shelby tube samplers.

Penetration resistance measurements were obtained by driving the split-spoon samplers into the subsurface materials with a 140-pound automatic hammer falling 30 inches. The penetration resistance value is a useful index in estimating the consistency or relative density of materials encountered.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Groundwater conditions were evaluated in each boring at the time of site exploration and after 24 hours. Once the groundwater levels were recorded the boreholes were backfilled with the auger cuttings.

Terracon utilized the SeisOpt® ReMi™ method to develop the full depth shear wave velocity profile at the site for use in determining the seismic site class. This method employs non-linear optimization technology to derive one-dimensional S-wave velocities from refraction microtremor (ambient noise) recordings using a typical seismograph and standard, low frequency, refraction

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geophones. We utilized 24 receivers (geophones) set along a straight-line array with a 13±-foot receiver spacing for a total length of about 300 feet along Array 1 shown on Figure 2, Boring Location Plan. Unfiltered, 30-second records were recorded using the background 'noise' created by the moving traffic and other ambient vibrations. The collected data, the response spectrum in the 5 to 40 Hz range, was processed using the computer software SeisOpt® ReMi™ by Optim, LLC with the results plotted as a conventional shear wave velocity vs. depth profile. The shear wave velocity profile obtained using the SeisOpt® ReMi™ data reduction method is shown on Figure 3.



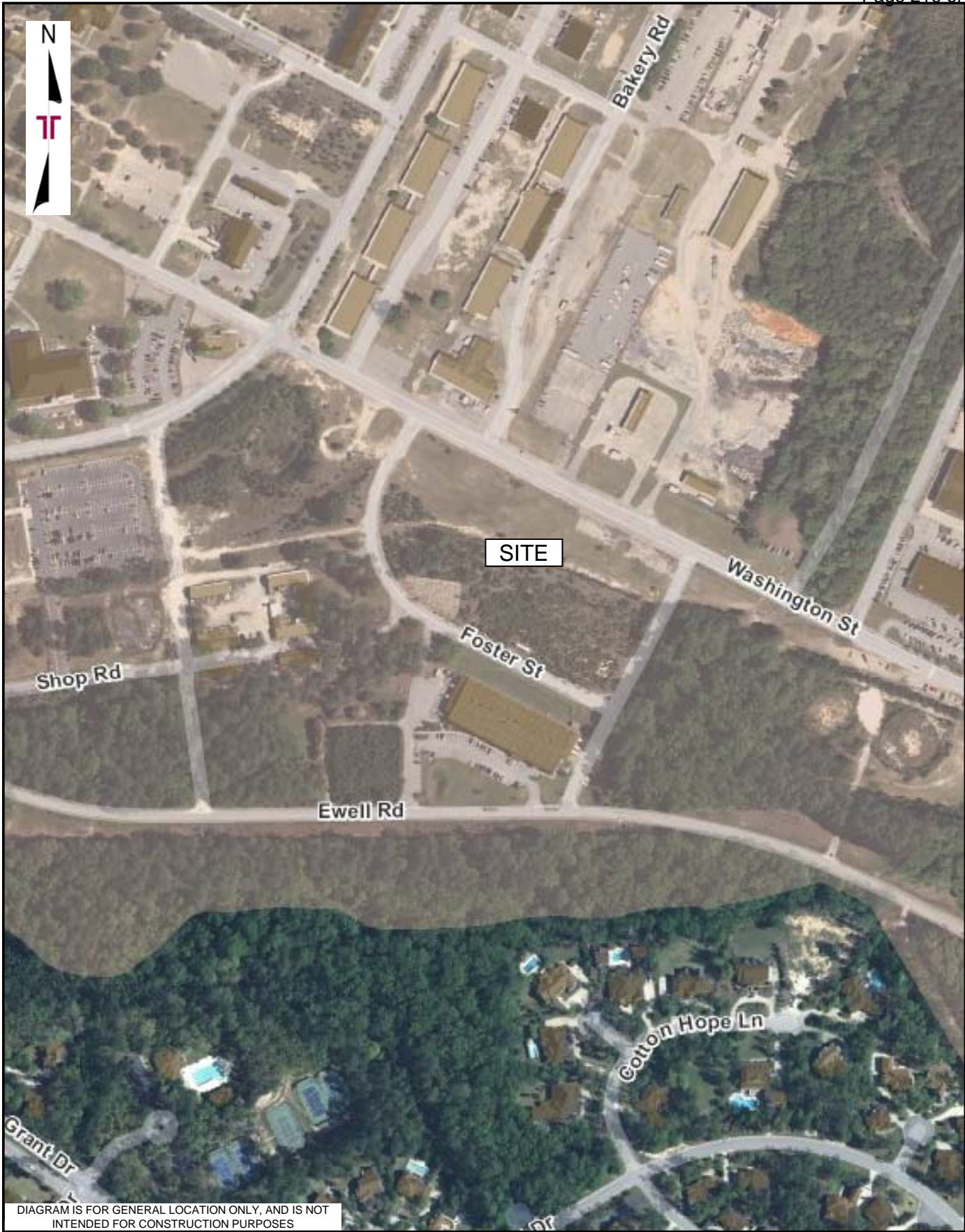


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Project Mngr.	PAM
Drawn By:	PTK
Checked By:	PAM
Approved By:	PAM
Project No.	73105046
Scale:	N.T.S.
File Name:	Fig 1
Date:	August 2010

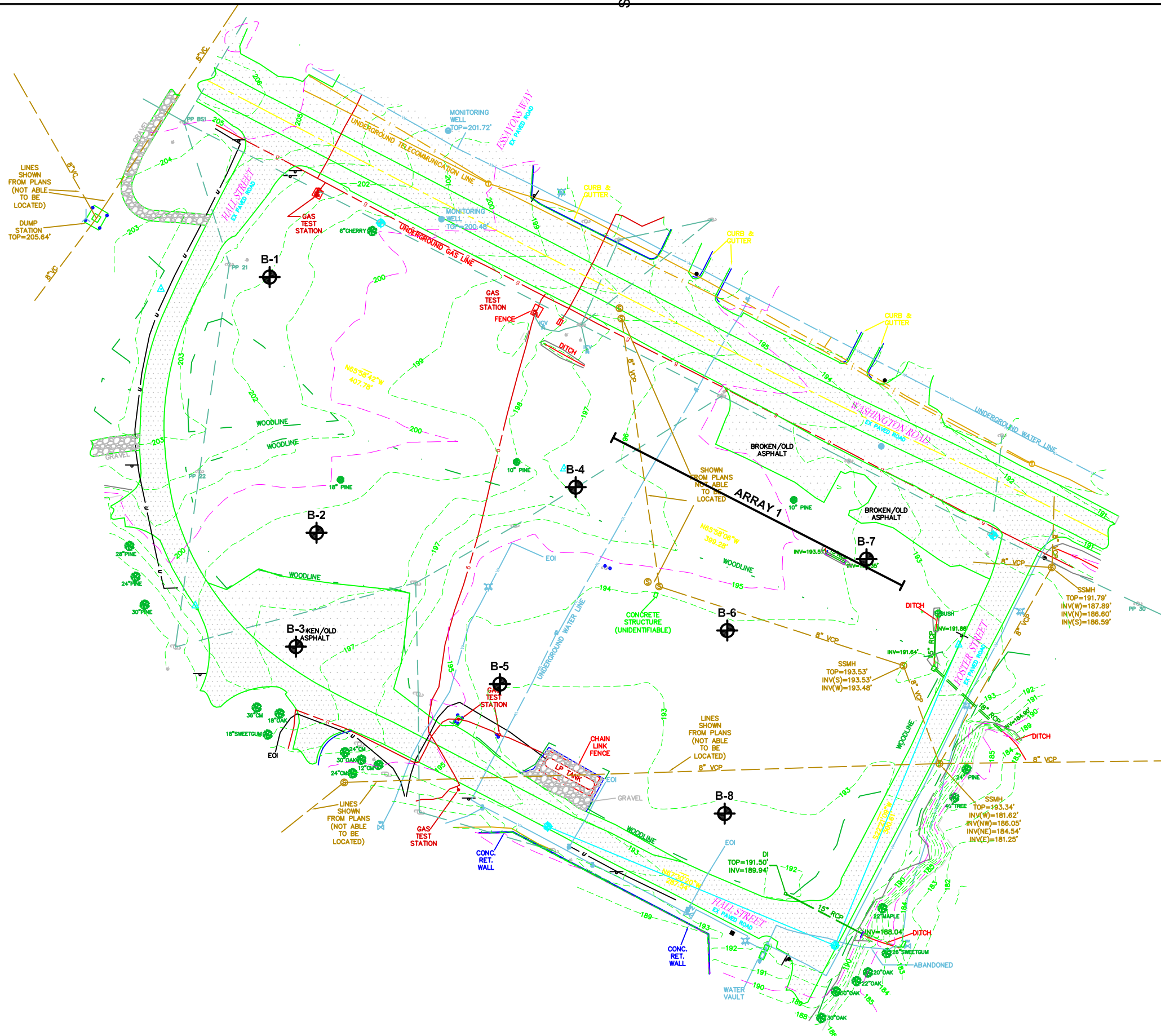
**Terracon**  
Consulting Engineers & Scientists

521 CLEMSON ROAD  
PH. (803) 741-9000

COLUMBIA, SC 29229  
FAX. (803) 741-9900

SITE LOCATION MAP
TRAINING SUPPORT CENTER #W912HN-10-D-0019 FORT JACKSON, SOUTH CAROLINA

FIG No.
1



**EXPLANATION**

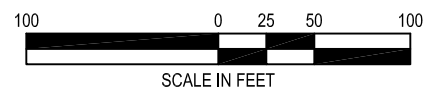


BORING LOCATION



REMI ARRAY LOCATION

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES



Project Mngt:	PAM	Project No.	73105046
Drawn By:	PTK	Scale:	AS SHOWN
Checked By:	PAM	File No.	73105046
Approved By:	PAM	Date:	AUGUST 2010

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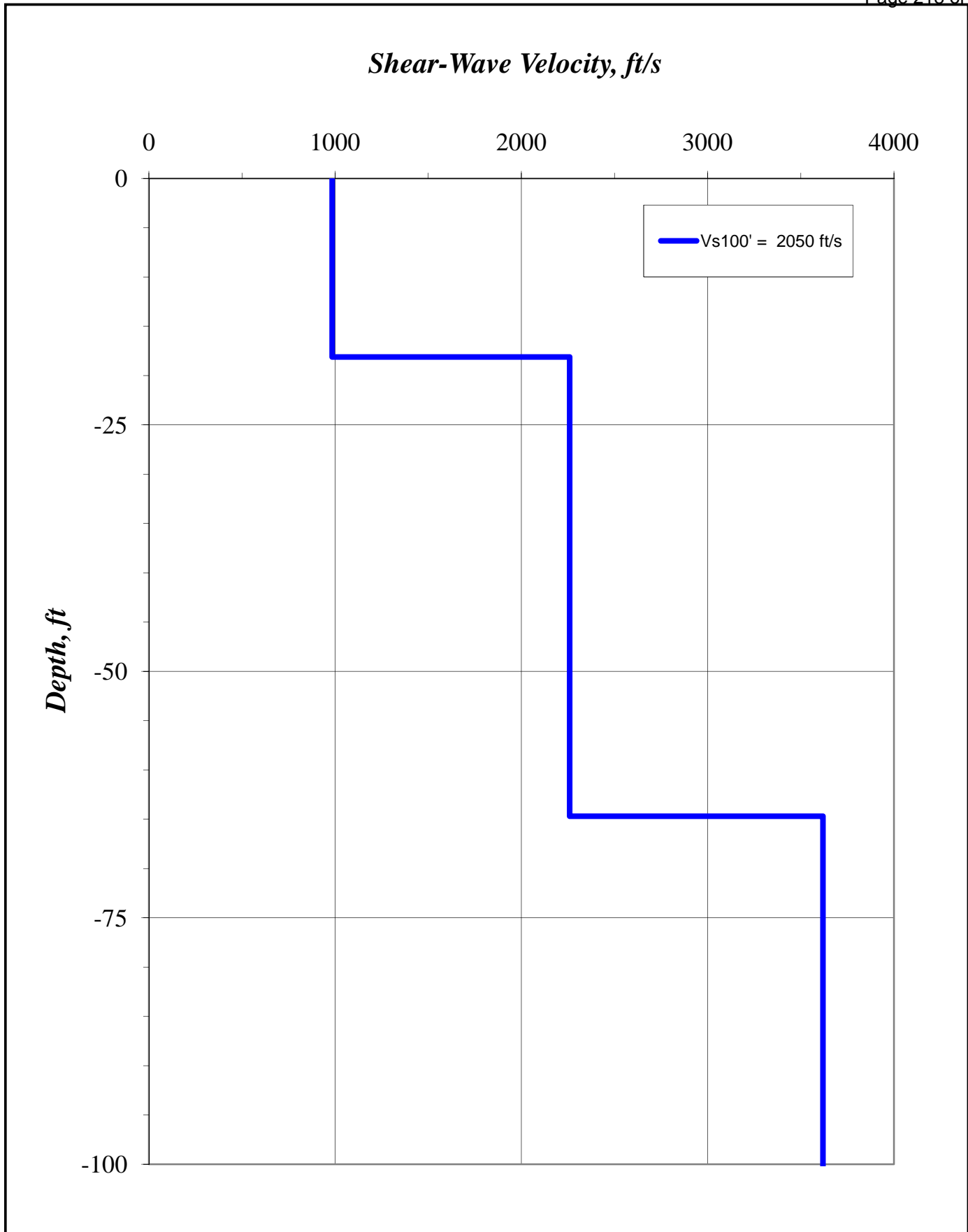
**BORING LOCATION PLAN**

TRAINING SUPPORT CENTER #W912HN-10-D-0019  
FORT JACKSON, SOUTH CAROLINA

FIG. No.

2





Project Mngr.	PAM	Project No.	73105046
Drawn By:	PTK	Scale:	N.T.S.
Checked By:	PAM	File Name:	Fig 3
Approved By:	PAM	Date:	August 2010

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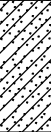



521 CLEMSON ROAD COLUMBIA, SC 29229  
PH. (803) 741-9000 FAX. (803) 741-9900

<b>SHEAR WAVE VELOCITY PROFILE</b>
<b>TRAINING SUPPORT CENTER #W912HN-10-D-0019</b>
<b>FORT JACKSON, SOUTH CAROLINA</b>

FIG No.
<b>3</b>

## LOG OF BORING NO. B-1

Page 1 of 1

CLIENT											
SEPI ENGINEERING AND CONSTRUCTION											
SITE		PROJECT									
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019									
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS			
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	
	Approx. Surface Elev.: 202 ft										
	<u>FINE TO MEDIUM SAND</u> , with silt and clay, orange, medium dense	3		1	HS SS		10	6			
	<u>CLAYEY FINE TO MEDIUM SAND</u> , orangish gray, loose	8		2	HS SS		5	12			
	<u>SILTY FINE TO MEDIUM SAND</u> , light grayish tan, medium dense ▼	12		3	HS SS		9	17			
	<u>CLAYEY FINE TO MEDIUM SAND</u> , light tannish gray, medium dense ▽	17		4	HS SS		12	19			
	No Recovery	22		5	HS						
	<u>CLAY</u> , with fine sand, light tan, hard	27		6	SS HS		27	19			
	<u>FINE SANDY SILT</u> , light whitish tan, hard	32		7	SS HS						
	<u>SILTY CLAYEY FINE SAND</u> , mottled (orange, brown, and tan), very dense	40		8	SS HS		54				
	<b>BORING TERMINATED</b>	40		9	SS HS		55				
				10	SS		50/5"				
							61				

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	12	WL	9	24hrs
WL		WL		
WL		WCI	20	

# Terracon

BORING STARTED		7-29-10	
BORING COMPLETED		7-29-10	
RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

TEST PIT LIBRARY 73105046.GPJ GAGE TERRACON.GDT 8/23/10

Friday, May 27, 2011

## LOG OF BORING NO. B-2

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CLIENT											
SEPI ENGINEERING AND CONSTRUCTION											
SITE		PROJECT									
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019									
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES			TESTS				
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	
	Approx. Surface Elev.: 199 ft										
	<b><u>FINE TO MEDIUM SAND</u></b> , with clay, orangish brown, medium dense to loose			HS							
			1	SS		13					
	<b><u>CLAYEY FINE TO MEDIUM SAND</u></b> , gray with tannish orange, medium dense	5.5		HS							
			2	SS		8					
	<b><u>FINE TO COARSE SAND</u></b> , with silt and gravel, tan and orange, dense	12		HS							
			3	SS		10					
	<b><u>FINE SANDY SILT</u></b> , tannish gray, stiff	17		HS							
			4	SS		10					
	<b><u>FINE SANDY SILT</u></b> , tannish gray, hard to very stiff	22		HS							
			6	SS		10					
	<b><u>SILTY FINE SAND</u></b> , mottled (orange, gray, red), dense to very dense	32		HS							
			7	SS		68					
	<b>BORING TERMINATED</b>	40		HS							
			8	SS		24					
			9	SS		50/5"					
				HS							
			10	SS		58					

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ 8	WL	▽ 7	24hrs
WL	▽	WL	▽	
WL		WCI	21	













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RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

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Friday, May 27, 2011

## LOG OF BORING NO. B-3

Page 1 of 1

CLIENT									
SEPI ENGINEERING AND CONSTRUCTION									
SITE		PROJECT							
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019							
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES			TESTS		
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf
	Approx. Surface Elev.: 198 ft								
	0.1 <u>ASPHALT</u> , (1 inch)	198			HS				
	<u>FINE TO MEDIUM SAND</u> , with silt and clay, light gray to dark gray, very loose to loose			1	SS		2	14	
					HS				
	5.5	192.5	5	2	SS		5	12	
	<u>CLAYEY FINE TO MEDIUM SAND</u> , gray with red, loose to medium dense				HS				
				3	SS		7	14	
					HS				
	12	186	10	4	SS		17	13	
	<u>CLAYEY FINE TO MEDIUM SAND</u> , trace mica, light gray, dense				HS				
				5	SS		37		
	17	181	15		HS				
	<u>FINE SANDY SILT</u> , light gray and white, stiff			6	SS		12		
			20		HS				
	22	176			HS				
	<u>SILTY FINE SAND</u> , orangish gray, very dense to dense			7	SS		70		
					HS				
			25		HS				
	32	166	30	8	SS		40		
	<u>FINE SANDY SILT</u> , mottled (brown, red, gray), hard				HS				
					HS				
			35	9	SS		71		
					HS				
	40	158	40	10	SS		50/2"		
	<b>BORING TERMINATED</b>								

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ 10	WL	▽ 9	24hrs
WL	▽	WL	▽	
WL		WCI	18	





















BORING STARTED		7-29-10	
BORING COMPLETED		7-29-10	
RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

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## LOG OF BORING NO. B-4

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CLIENT											
SEPI ENGINEERING AND CONSTRUCTION											
SITE		PROJECT									
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019									
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES			TESTS				
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	
	Approx. Surface Elev.: 197 ft										
	0.3 <u>TOPSOIL</u> , grass root mat (3 inches)	196.5			HS						
	<u>CLAYEY FINE TO MEDIUM SAND</u> , reddish brown, loose (Fill)	194		1	SS		6				
	<u>CLAYEY SAND</u> , dark blackish brown and dark gray, very loose to loose				HS						
				2	SS		3				
					HS						
				3	SS		5				
	8 <u>SILTY FINE SAND</u> , gray, loose	189			HS						
				4	SS		9				
					HS						
	12	185			HS						
	<u>SILTY FINE TO COARSE SAND</u> , with gravel, light gray, medium dense				HS						
				5	SS		25				
					HS						
	17	180			HS						
	<u>SILTY FINE SAND</u> , tannish gray, medium dense to dense				HS						
				6	SS		13				
					HS						
					HS						
				7	SS		18				
					HS						
					HS						
				8	SS		42				
					HS						
					HS						
					HS						
	32	165			HS						
	<u>SILTY FINE SAND</u> , orange and red, very dense				HS						
				9	SS		50/5"				
					HS						
					HS						
					HS						
				10	SS		50/5"				
					HS						
	40	157			HS						
	<b>BORING TERMINATED</b>										

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ 9	WL	▽ 8	24hrs
WL	▽	WL	▽	
WL		WCI	9	


BORING STARTED		7-29-10	
BORING COMPLETED		7-29-10	
RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

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## LOG OF BORING NO. B-5

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CLIENT											
SEPI ENGINEERING AND CONSTRUCTION											
SITE		PROJECT									
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019									
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS			
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf		UNCONFINED STRENGTH, psf
	Approx. Surface Elev.: 193 ft										
	1				HS						
				1	SS		5	11			
	3				HS						
				2	SS		2	33			
		5			HS						
					ST						
					HS						
				3	SS		2	20			
		10			HS						
	12										
				4	SS		10	18			
					HS						
				5	SS		21				
					HS						
	22										
				6	SS		62				
					HS						
				7	SS		40				
					HS						
	32										
				8	SS		50/5"				
					HS						
				9	SS		69				
	40										
BORING TERMINATED		40									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ 7	WL	▽
WL	▽	WL	▽
WL			

# Terracon


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RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

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## LOG OF BORING NO. B-6

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CLIENT											
SEPI ENGINEERING AND CONSTRUCTION											
SITE		PROJECT									
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019									
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES			TESTS				
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf		UNCONFINED STRENGTH, psf
	Approx. Surface Elev.: 194 ft										
	1 <b>TOPSOIL</b> , (12 inches)	193		HS							
	<b>CLAYEY FINE TO MEDIUM SAND</b> , mottled (gray, brown, red), medium dense to loose (Fill)		1	SS		13					
				HS			14				
			2	SS		5					
	5.5	188.5	5		HS						
	<b>CLAYEY FINE SAND</b> , gray, loose to very loose		3	SS		5					
				HS							
			4	SS		3	15				
	12	182	10		HS						
	<b>SILTY FINE SAND</b> , gray and orange, medium dense to dense			5	SS		22	20			
				HS							
			6	SS		40					
				HS							
22		172	20								
<b>CLAYEY FINE TO COARSE SAND</b> , with quartz, gray, very dense			7	SS		50/5"					
				HS							
	27	167	30		8	SS		66			
<b>SILTY FINE SAND</b> , mottled (brown, orange, gray), very dense				HS							
				9	SS		50				
					HS						
40	154	40			10	SS		50/1"			
	<b>BORING TERMINATED</b>										

The stratification lines represent the approximate boundary lines  
between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ 22	WL	▽
WL	▽	WL	▽
WL		WL	











# Terracon

BORING STARTED		7-29-10	
BORING COMPLETED		7-29-10	
RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

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## LOG OF BORING NO. B-7

Page 1 of 1

CLIENT											
SEPI ENGINEERING AND CONSTRUCTION											
SITE		PROJECT									
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019									
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES				TESTS			
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf	UNCONFINED STRENGTH, psf	
	Approx. Surface Elev.: 194 ft										
	0.3 <u>ROOT MAT</u> , grassed (4 inches)	193.5		HS							
	<u>CLAYEY SILTY FINE TO MEDIUM SAND</u> , mottled (gray, brown, red), loose to very loose (Fill)		1	SS		6	20				
	5.5	188.5		HS							
	<u>CLAYEY FINE SAND</u> , dark gray, very loose to loose		2	SS		2					
	8 <u>FINE SANDY CLAY</u> , light gray, medium stiff	186		HS							
			3	SS		4	16				
	12	182		HS							
	<u>SILTY FINE TO COARSE SAND</u> , gray, medium dense to dense		4	SS		4					
	22	172		HS							
	<u>SILTY FINE TO COARSE SAND</u> , gray, loose		5	SS		21	19				
	27	167		HS							
	<u>FINE SANDY SILT</u> , gray, hard		6	SS		35					
	32	162		HS							
	<u>SILTY FINE SAND</u> , gray and tan, very dense		7	SS		9					
	40	154		HS							
	<u>SILTY FINE SAND</u> , gray and tan, very dense		8	SS		28					
				HS							
				9	SS		50/5"				
				HS							
				10	SS		50/3"				
BORING TERMINATED		40									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ 24	WL	▽ 10	24hrs
WL	▽	WL	▽	
WL		WCI	12	




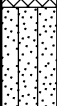

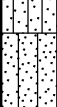
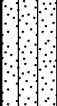
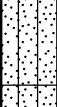
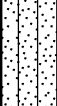
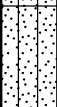
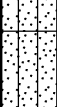

BORING STARTED		7-29-10	
BORING COMPLETED		7-29-10	
RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

Friday, May 27, 2011



## LOG OF BORING NO. B-8

Page 1 of 1

CLIENT									
SEPI ENGINEERING AND CONSTRUCTION									
SITE		PROJECT							
FORT JACKSON, SOUTH CAROLINA		TRAINING SUPPORT CENTER #W912HN-10-D-0019							
GRAPHIC LOG	DESCRIPTION	DEPTH, ft.	USCS SYMBOL	SAMPLES			TESTS		
				NUMBER	TYPE	RECOVERY, in.	SPT - N BLOWS / ft.	WATER CONTENT, %	DRY UNIT WT pcf
	Approx. Surface Elev.: 193 ft								
	0.3 <u>GRASS</u> , root mat (4 inches)	192.5			HS				
	<u>CLAYEY FINE TO MEDIUM SAND</u> , mottled (gray, red, light brown), medium dense to loose (Fill)			1	SS		17	9	
					HS				
				2	SS		13		
					HS				
				3	SS		8	8	
					HS				
				4	SS		5		
					HS				
				5	SS		12		
					HS				
				6	SS		10		
					HS				
				7	SS		15		
					HS				
				8	SS		70		
					HS				
				9	SS		20		
					HS				
				10	SS		50/2"		
BORING TERMINATED									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

## WATER LEVEL OBSERVATIONS, ft

WL	▽ DRY	WL	▽
WL	▽	WL	▽
WL	DCI 11		



BORING STARTED		7-29-10	
BORING COMPLETED		7-29-10	
RIG	CME-550	FOREMAN	TG
APPROVED	FPM	JOB #	73105046

Friday, May 27, 2011

## **APPENDIX B**

### **LABORATORY TESTING**

**Geotechnical Engineering Report**

Training Support Center ■ Ft. Jackson, SC

August 23, 2010 ■ Terracon Project No. 73105046

**Laboratory Testing Description**

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Consolidation
- Sieve Analysis
- In-situ Water Content

Borehole	Depth ft	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	USCS Class- ification	Water Content (%)	Dry Unit Weight (pcf)	Satur- ation (%)	Void Ratio
B-1	3.5				9.5	21					
B-1	8.5				9.5	16					
B-3	3.5				9.5	11					
B-3	8.5				9.5	21					
B-4A	4.0				9.5	28					
B-8	1.0				9.5	21					
B-8	6.0				9.5	29					

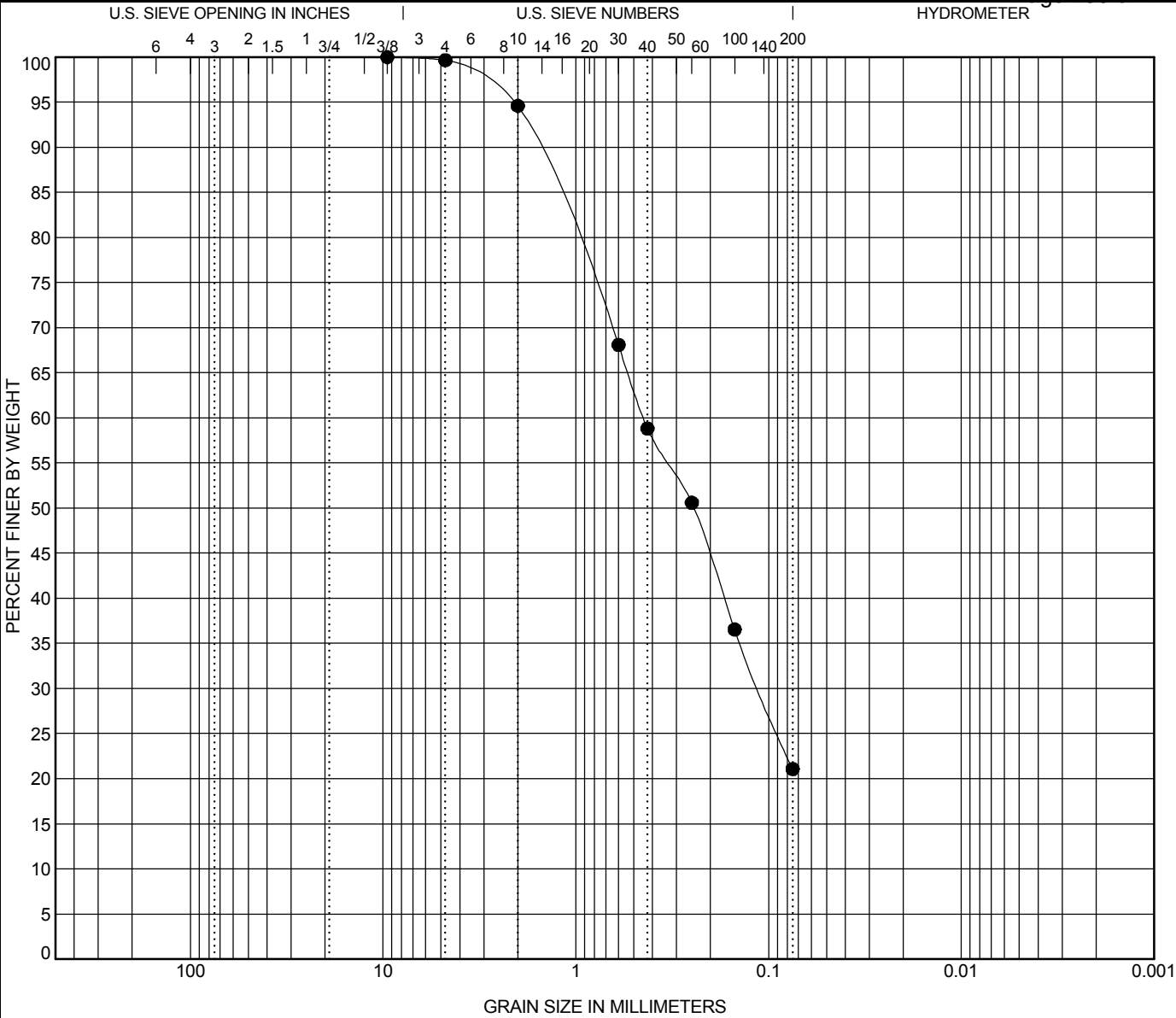
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SUMMARY OF LABORATORY RESULTS

Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019  
Site: FORT JACKSON, SOUTH CAROLINA  
Job #: 73105046  
Date: 8-23-10

Friday, May 27, 2011



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification					LL	PL	PI	Cc	Cu
●	B-1	3.5ft									
☒											
▲											
★											
⊙											

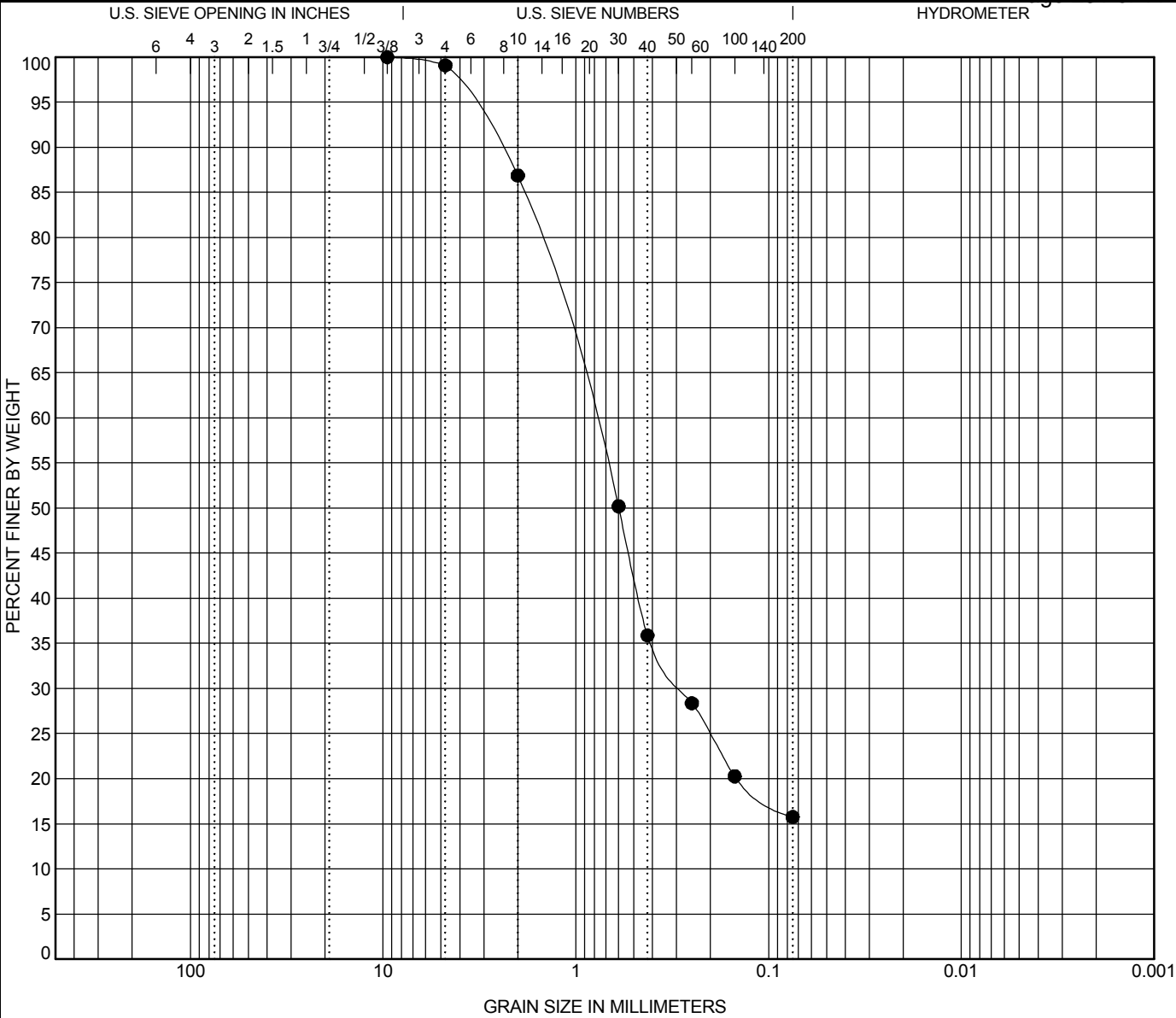
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	3.5ft	9.5	0.444	0.112	-	-	21	
☒						-	-		
▲						-	-		
★						-	-		
⊙						-	-		



GRAIN SIZE DISTRIBUTION

Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019  
Site: FORT JACKSON, SOUTH CAROLINA  
Job #: 73105046  
Date: 8-23-10

TC: GRAIN SIZE 73105046.GPJ GAGE TERRACON.GDT 8/23/10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

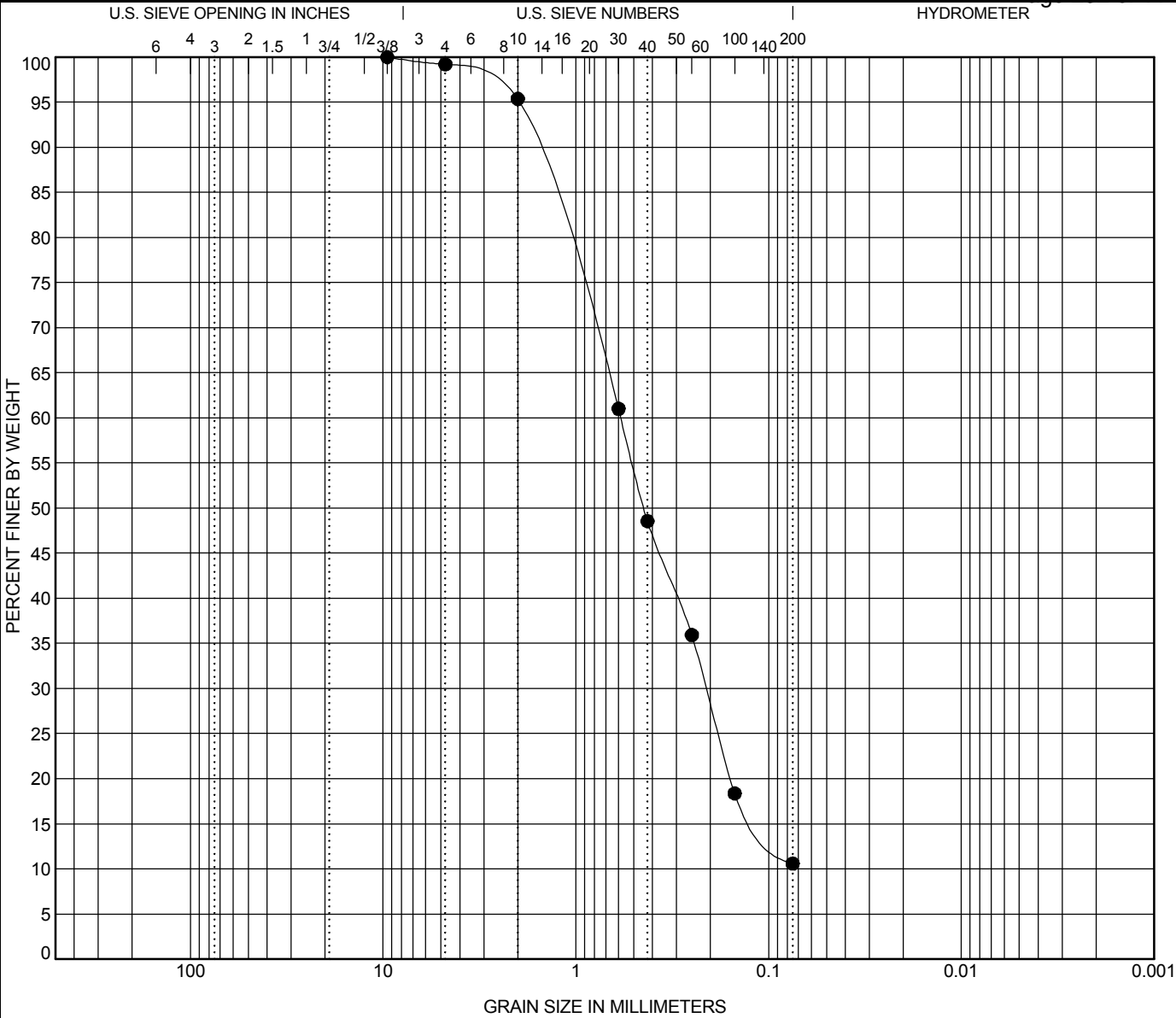
Specimen Identification		Classification				LL	PL	PI	Cc	Cu
●	B-1	8.5ft								
☒										
▲										
★										
⊙										

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-1	8.5ft	9.5	0.828	0.281	-	-	16	
☒						-	-		
▲						-	-		
★						-	-		
⊙						-	-		

Terracon

GRAIN SIZE DISTRIBUTION

Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019  
Site: FORT JACKSON, SOUTH CAROLINA  
Job #: 73105046  
Date: 8-23-10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

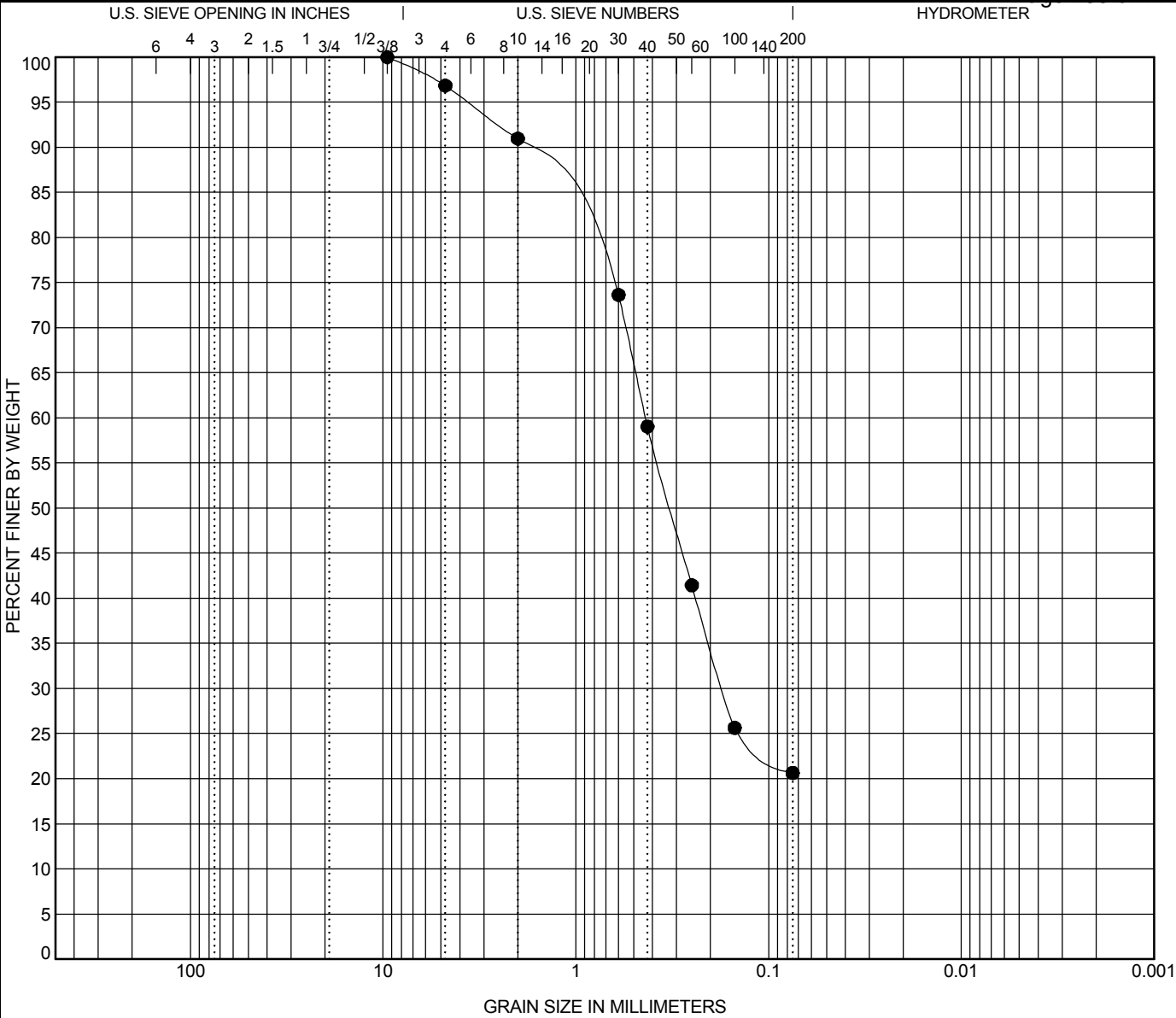
Specimen Identification		Classification					LL	PL	PI	Cc	Cu
●	B-3 3.5ft									1.07	8.19
☒											
▲											
★											
◎											
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay		
●	B-3 3.5ft	9.5	0.583	0.21		-	-	11			
☒						-	-				
▲						-	-				
★						-	-				
◎						-	-				



GRAIN SIZE DISTRIBUTION

Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019  
Site: FORT JACKSON, SOUTH CAROLINA  
Job #: 73105046  
Date: 8-23-10

TC: GRAIN SIZE 73105046.GPJ GAGE TERRACON.GDT 8/23/10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification				LL	PL	PI	Cc	Cu
●	B-3	8.5ft								
☒										
▲										
★										
◎										

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-3	8.5ft	9.5	0.435	0.173	-	-	21	
☒						-	-		
▲						-	-		
★						-	-		
◎						-	-		

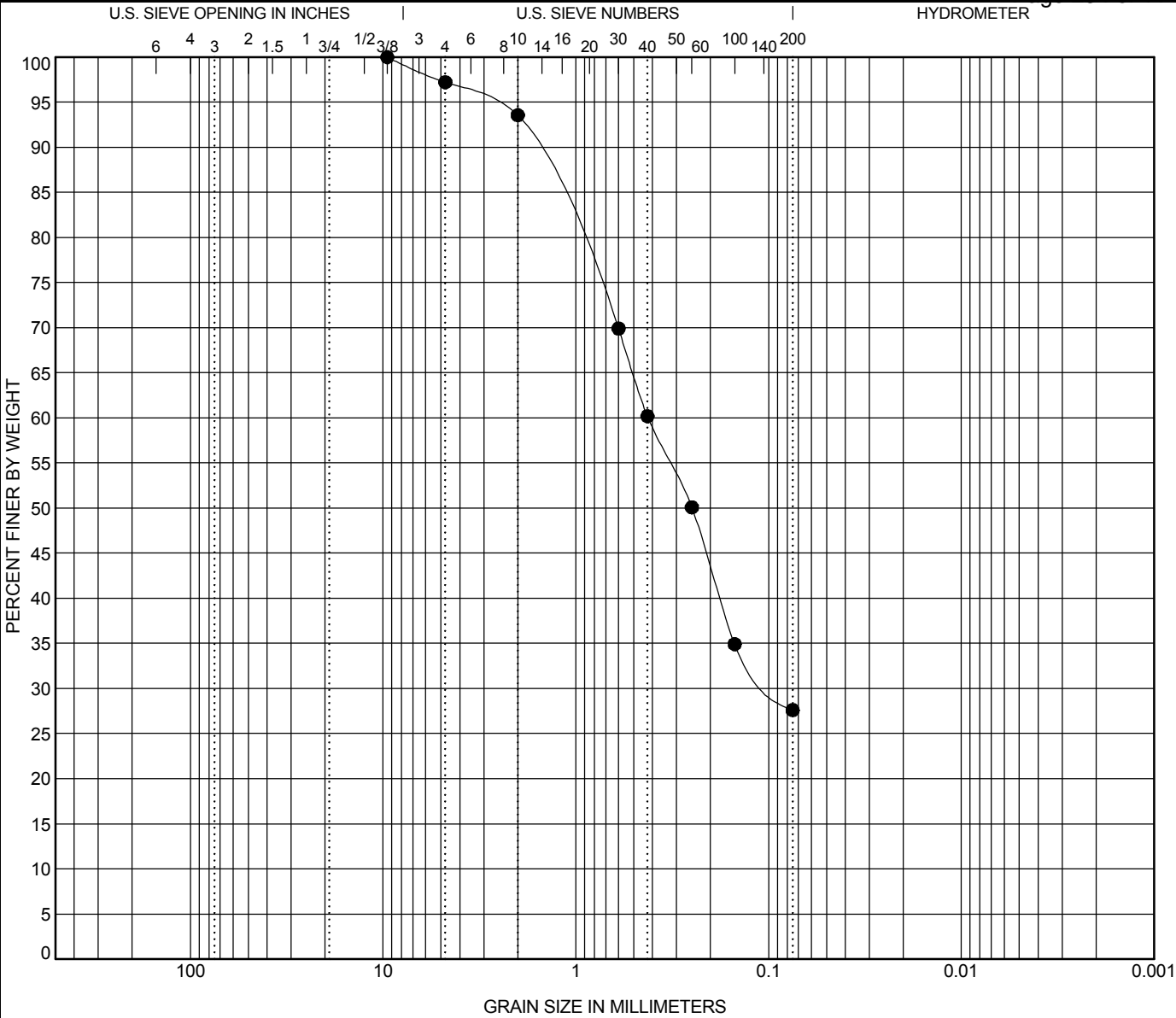


GRAIN SIZE DISTRIBUTION

Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019  
Site: FORT JACKSON, SOUTH CAROLINA  
Job #: 73105046  
Date: 8-23-10

TC: GRAIN SIZE 73105046.GPJ GAGE TERRACON.GDT 8/23/10

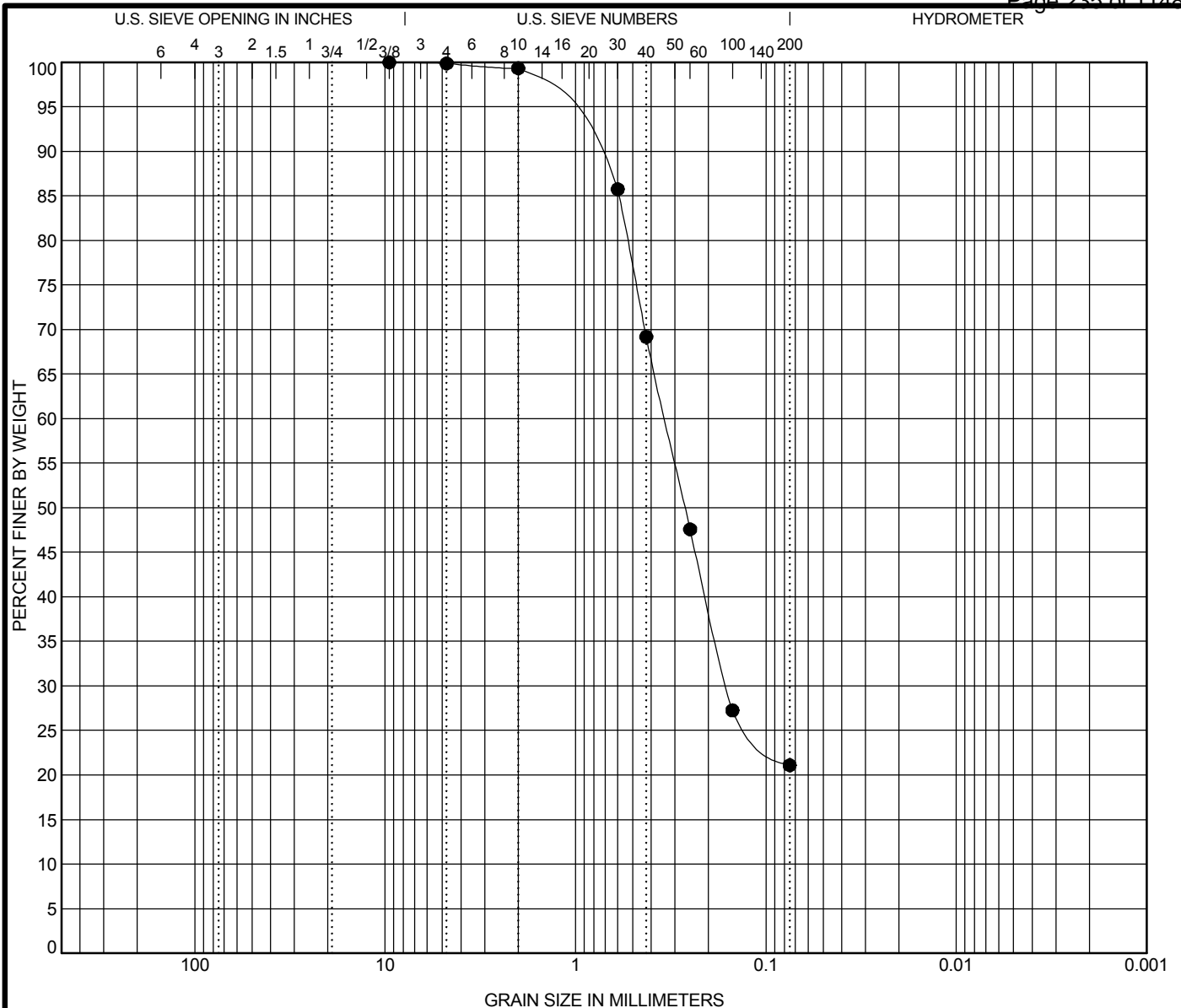




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification				LL	PL	PI	Cc	Cu
●	B-4A 4.0ft									
☒										
▲										
★										
◎										
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay	
●	B-4A 4.0ft	9.5	0.421	0.094		-	-	28		
☒						-	-			
▲						-	-			
★						-	-			
◎						-	-			





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	B-8	1.0ft						
☒								
▲								
★								
◎								

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-8 1.0ft	9.5	0.339	0.161		-	-	21	
☒						-	-		
▲						-	-		
★						-	-		
◎						-	-		

# Terracon

## GRAIN SIZE DISTRIBUTION

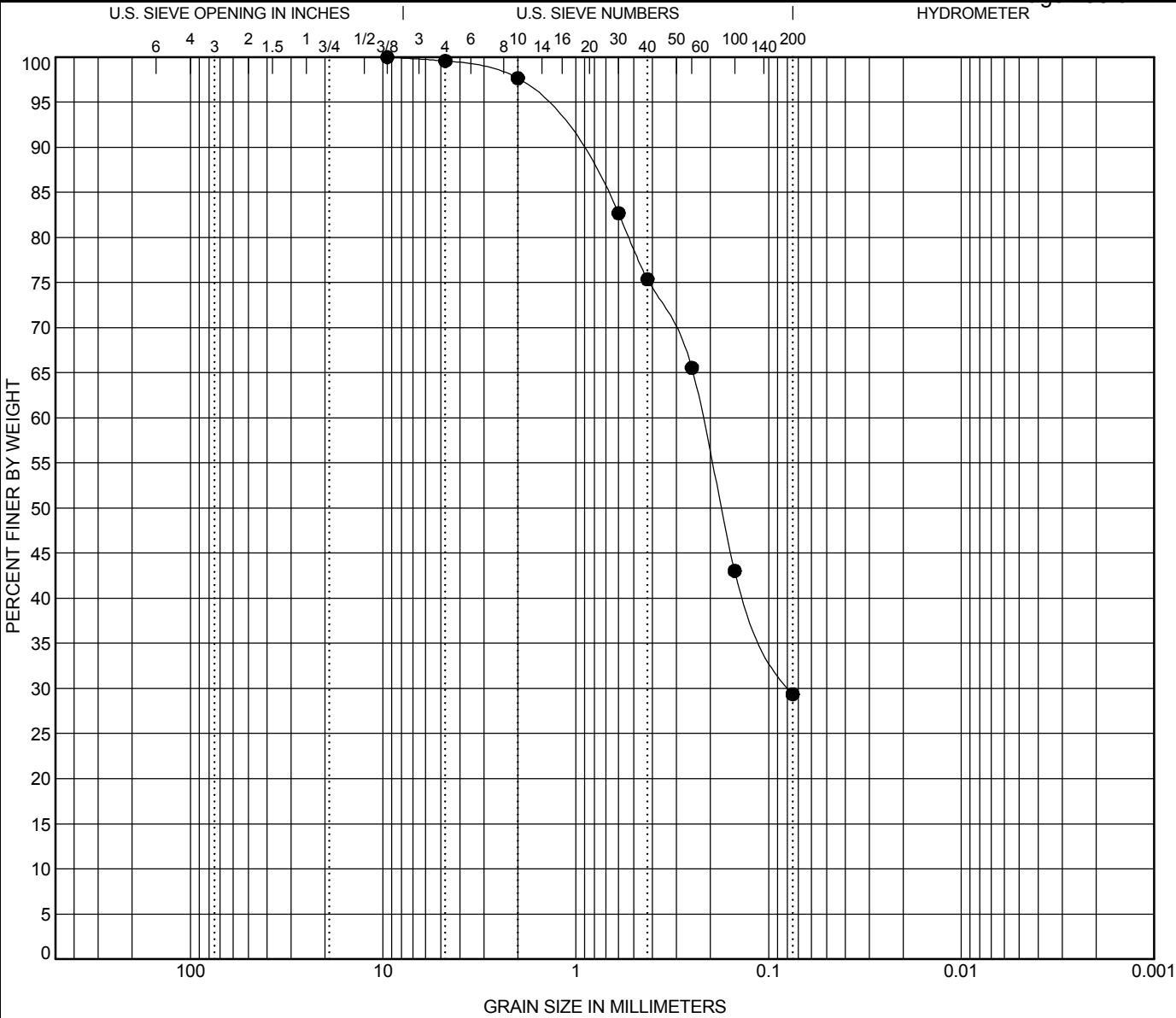
Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019

Site: FORT JACKSON, SOUTH CAROLINA

Job #: 73105046

Date: 8-23-10

Friday, May 27, 2011



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification				LL	PL	PI	Cc	Cu
●	B-8 6.0ft									
☒										
▲										
★										
⊙										

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-8 6.0ft	9.5	0.22	0.077		-	-	29	
☒						-	-		
▲						-	-		
★						-	-		
⊙						-	-		

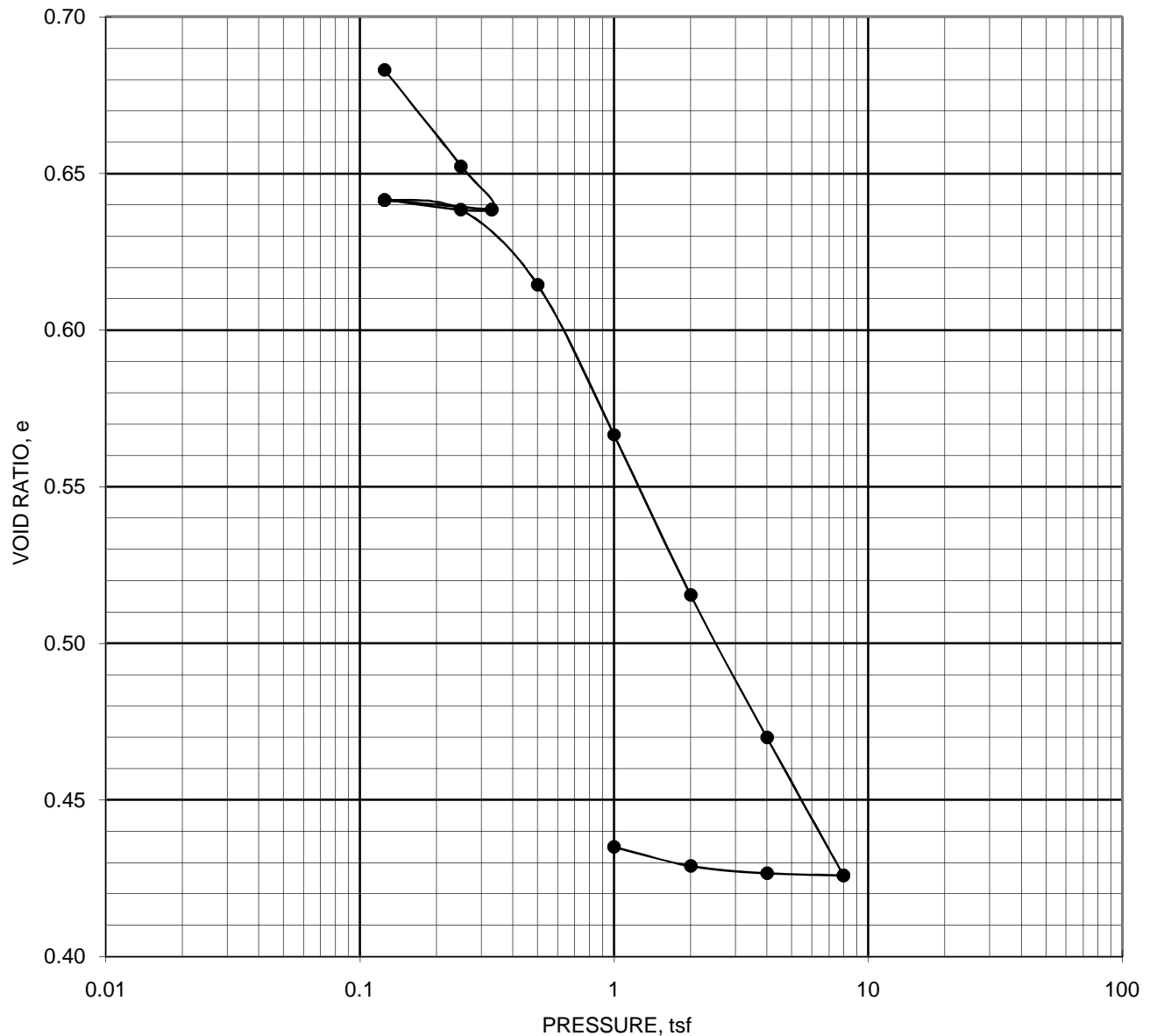
Terracon

GRAIN SIZE DISTRIBUTION

Project: TRAINING SUPPORT CENTER #W912HN-10-D-0019  
Site: FORT JACKSON, SOUTH CAROLINA  
Job #: 73105046  
Date: 8-23-10

TC: GRAIN SIZE 73105046.GPJ GAGE TERRACON.GDT 8/23/10

# ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS ASTM D2435

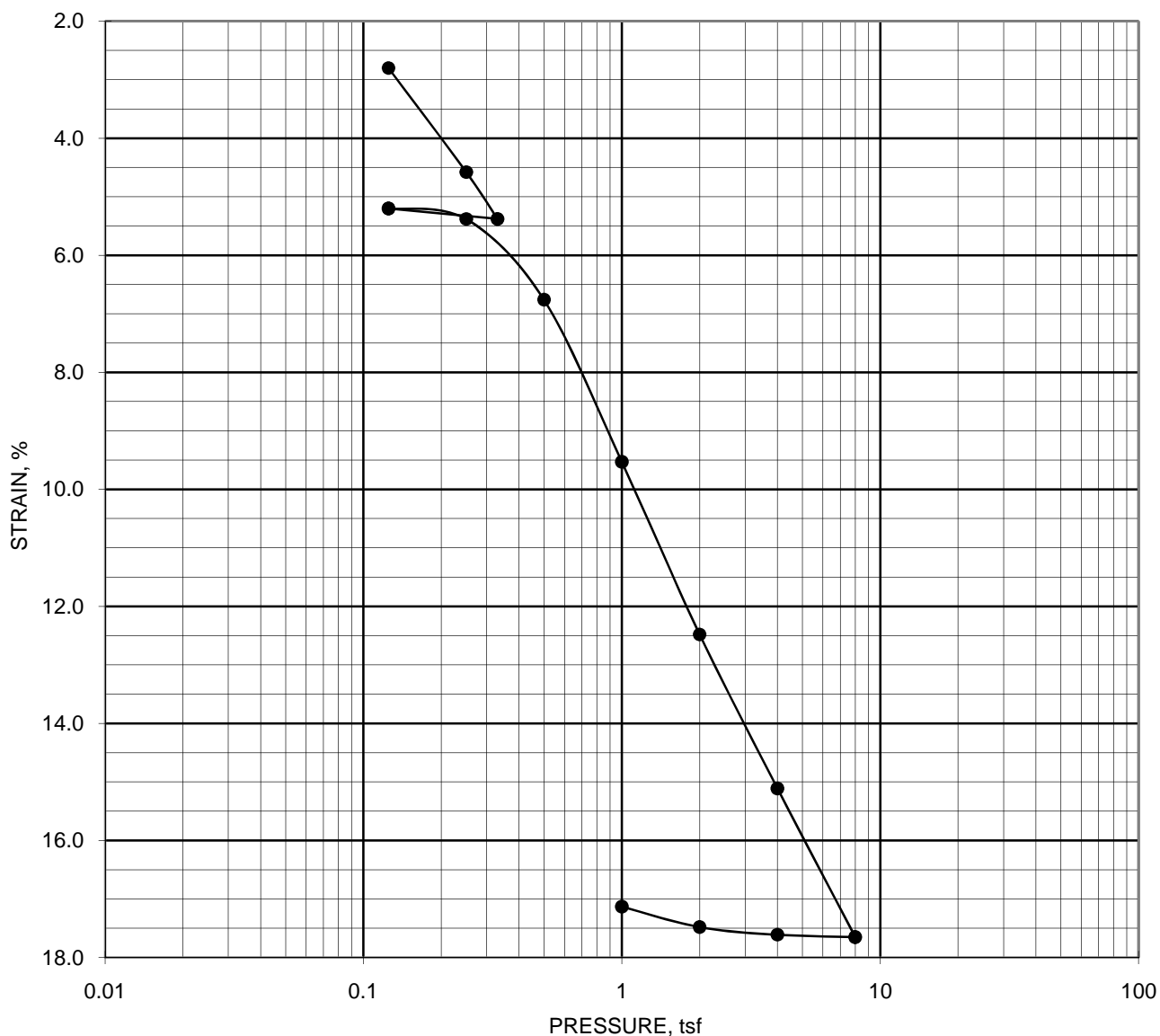


DIAMETER, mm	63.50	HEIGHT, mm	25.40	PROPERTY		BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, tsf		0.33		MOISTURE, %		11.9	9.9
PRECONSOL. PRESSURE, tsf		0.36		DRY DENSITY, pcf		97.3	119.2
OVER CONSOLIDATION RATIO		1.1		SATURATION, %		44	61
COMPRESSION INDEX		0.16		VOID RATIO		0.732	0.455
REBOUND INDEX		0.010		SAMPLE TYPE		3" SHELBY TUBE	
LIQUID LIMIT	n/a	PLASTIC LIMIT	n/a	PLASTICITY INDEX	n/a	SPECIFIC GRAVITY	2.70 ASSUMED
SAMPLE DESCRIPTION Brown and tan medium to coarse silty SAND							
BORING NO.	B-4	SAMPLE NO.	.0001	DEPTH, feet	4 to 6		

TSC Fort Jackson  
Columbia, SC  
73105046  
8/12/2010

**Terracon**

# ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF COHESIVE SOILS ASTM D2435



DIAMETER, mm	63.50	HEIGHT, mm	25.40	PROPERTY		BEFORE TEST	AFTER TEST
OVERBURDEN PRESSURE, tsf		0.33		MOISTURE, %		11.9	9.9
PRECONSOL. PRESSURE, tsf		0.36		DRY DENSITY, pcf		97.3	119.2
OVER CONSOLIDATION RATIO		1.1		SATURATION, %		44	61
COMPRESSION INDEX		0.16		VOID RATIO		0.732	0.455
REBOUND INDEX		0.010		SAMPLE TYPE		3" SHELBY TUBE	
LIQUID LIMIT	n/a	PLASTIC LIMIT	n/a	PLASTICITY INDEX	n/a	SPECIFIC GRAVITY	2.70 ASSUMED
SAMPLE DESCRIPTION		Brown and tan medium to coarse silty SAND					
BORING NO.	B-4		SAMPLE NO.	.0001		DEPTH, feet	4 to 6

TSC Fort Jackson  
Columbia, SC  
73105046  
8/12/2010

**Terracon**

N:\LAB REPORTS\Consolidation\73105046 B-4A 4-6.xls\REPORT % Strain

TSC Fort Jackson  
Columbia, SC  
73105046  
8/12/2010

ADDITIONAL CONSOLIDATION DATA

B-4  
.0001  
4 to 6

<u>PRESSURE,</u> <u>tsf</u>	<u>Cv50,</u> <u>cm2/sec</u>	<u>Cv90,</u> <u>cm2/sec</u>	<u>Av,</u> <u>cm2/g</u>	<u>Mv,</u> <u>cm2/g</u>	<u>k,</u> <u>cm/sec</u>
0.125	1.06E-02	1.45E-02	1.55E-05	9.48E-06	1.01E-07
0.25	8.84E-03	1.45E-02	2.55E-05	1.55E-05	1.37E-07
0.5	1.04E-02	1.20E-02	9.77E-05	5.96E-05	6.23E-07
1	9.98E-03	9.75E-03	9.80E-05	6.07E-05	6.06E-07
2	9.36E-03	1.07E-02	5.22E-05	3.33E-05	3.12E-07
4	8.77E-03	8.57E-03	2.33E-05	1.54E-05	1.35E-07
8	8.24E-03	9.44E-03	1.12E-05	7.64E-06	6.30E-08
AVERAGE	9.38E-03	1.10E-02	5.20E-05	3.23E-05	2.64E-07

**Terracon**

## **APPENDIX C**

### **SUPPORTING DOCUMENTS**

**GENERAL NOTES****DRILLING & SAMPLING SYMBOLS:**

SS: Split Spoon - 1-<sup>3</sup>/<sub>8</sub>" I.D., 2" O.D., unless otherwise noted  
 ST: Thin-Walled Tube - 2" O.D., unless otherwise noted  
 RS: Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted  
 DB: Diamond Bit Coring - 4", N, B  
 BS: Bulk Sample or Auger Sample

HS: Hollow Stem Auger  
 PA: Power Auger  
 HA: Hand Auger  
 RB: Rock Bit  
 WB: Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

**WATER LEVEL MEASUREMENT SYMBOLS:**

WL: Water Level      WS: While Sampling      N/E: Not Encountered  
 WCI: Wet Cave in      WD: While Drilling  
 DCI: Dry Cave in      BCR: Before Casing Removal  
 AB: After Boring      ACR: After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

**DESCRIPTIVE SOIL CLASSIFICATION:** Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

**CONSISTENCY OF FINE-GRAINED SOILS**

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Consistency</u>
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000      2,000	4-6	Medium Stiff
2,001 – 4,000      4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

**RELATIVE DENSITY OF COARSE-GRAINED SOILS**

<u>Standard Penetration or N-value (SS) Blows/Ft.</u>	<u>Relative Density</u>
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50+	Very Dense

**RELATIVE PROPORTIONS OF SAND AND GRAVEL**

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 – 29
Modifier	> 30

**GRAIN SIZE TERMINOLOGY**

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

**RELATIVE PROPORTIONS OF FINES**

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 – 12
Modifiers	> 12

**PLASTICITY DESCRIPTION**

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1-10
Medium	11-30
High	30+



# UNIFIED SOIL CLASSIFICATION SYSTEM

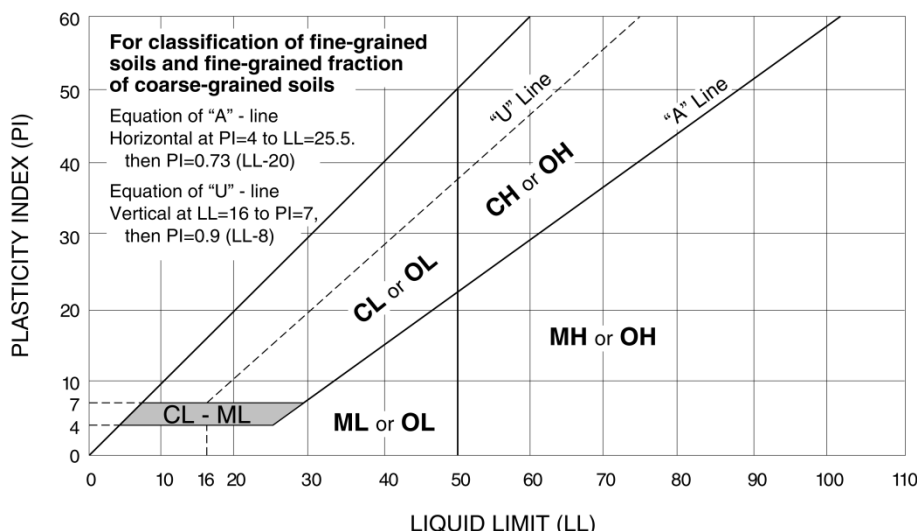
Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests<sup>A</sup>

Soil Classification

					Group Symbol	Group Name <sup>B</sup>	
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Less than 5% fines <sup>C</sup>	Gravels	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$	GW	Well-graded gravel <sup>F</sup>	
				$Cu < 4$ and/or $1 > Cc > 3^E$	GP	Poorly graded gravel <sup>F</sup>	
		Gravels with Fines More than 12% fines <sup>C</sup>	Fines	More	Fines classify as ML or MH	GM	Silty gravel <sup>F,G,H</sup>
					Fines classify as CL or CH	GC	Clayey gravel <sup>F,G,H</sup>
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Less than 5% fines <sup>D</sup>	Sands	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$	SW	Well-graded sand <sup>I</sup>	
				$Cu < 6$ and/or $1 > Cc > 3^E$	SP	Poorly graded sand <sup>I</sup>	
		Sands with Fines More than 12% fines <sup>D</sup>	Fines	More	Fines classify as ML or MH	SM	Silty sand <sup>G,H,I</sup>
					Fines Classify as CL or CH	SC	Clayey sand <sup>G,H,I</sup>
Fine-Grained Soils 50% or more passes No. 200 sieve	Silt and Clays Liquid limit less than 50	Inorganic		$PI > 7$ and plots on or above "A" line <sup>J</sup>	CL	Lean clay <sup>K,L,M</sup>	
				$PI < 4$ or plots below "A" line <sup>J</sup>	ML	Silt <sup>K,L,M</sup>	
		Organic		Liquid limit - oven dried	$< 0.75$	OL	Organic clay <sup>K,L,M,N</sup>
				Liquid limit - not dried			Organic silt <sup>K,L,M,O</sup>
	Silt and Clays Liquid limit 50 or more	Inorganic		$PI$ plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>	
				$PI$ lots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>	
		Organic		Liquid limit - oven dried	$< 0.75$	OH	Organic clay <sup>K,L,M,P</sup>
				Liquid limit - not dried			Organic silt <sup>K,L,M,Q</sup>
	Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

<sup>A</sup>Based on the material passing the 3-in. (75-mm) sieve<sup>B</sup>If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.<sup>C</sup>Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.<sup>D</sup>Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$^E Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup>If soil contains  $\geq 15\%$  sand, add "with sand" to group name.<sup>G</sup>If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.<sup>H</sup>If fines are organic, add "with organic fines" to group name.<sup>I</sup>If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.<sup>J</sup>If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.<sup>K</sup>If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.<sup>L</sup>If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.<sup>M</sup>If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.<sup>N</sup>PI  $\geq 4$  and plots on or above "A" line.<sup>O</sup>PI  $< 4$  or plots below "A" line.<sup>P</sup>PI plots on or above "A" line.<sup>Q</sup>PI plots below "A" line.

**Terracon**

Friday, May 27, 2011

# APPENDIX

## B

Not used.

# APPENDIX

## C

Not used.

See Appendix AA.

APPENDIX  
D



**Palmetto State**  
Utility Services, Inc.  
A Subsidiary of American States Utility Services, Inc.

### Hydrant Flow Test Report

Location Washington Road Date 09/14/10

Test made by Joey Williams, Doug Capell, Brian Johnson Time 1500

Representative of PSUS Hydrant #: 2203

Witness \_\_\_\_\_

State purpose of test USACE RFP - Design

Consumption rate during test \_\_\_\_\_

If pumps affect test, indicate pumps operating \_\_\_\_\_

$A_1$                        $A_2$                        $A_3$                        $A_4$

Flow hydrants: 2110

Size nozzle 2.5"

Pilot reading 60 psi

Discharge coefficient (Total gpm): .9 (1300 gpm)

gpm \_\_\_\_\_

Static B 122 psi                      Residual B 90 psi

Projected results @ 20 psi Residual \_\_\_\_\_ gpm: or @ \_\_\_\_\_ psi Residual \_\_\_\_\_ gpm

Remarks \_\_\_\_\_

Location map: Show line sizes and distance to next cross-connected line. Show valves and hydrant branch size. Indicate north. Show flowing hydrants – Label  $A_1$ ,  $A_2$ ,  $A_3$ ,  $A_4$ . Show location of static and residual – Label B.

Indicate B Hydrant \_\_\_\_\_ Sprinkler \_\_\_\_\_ Other (Identify) \_\_\_\_\_

US 12/14/09

Building 2576 Essayons Way, Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054



**Palmetto State**  
Utility Services, Inc.  
A Subsidiary of American States Utility Services, Inc.

### Hydrant Flow Test Report

Location Foster Street Date 09/14/10

Test made by Joey Williams, Doug Capell, Brian Johnson Time 1530

Representative of PSUS Hydrant #: 2201

Witness \_\_\_\_\_

State purpose of test USACE RFP - Design

Consumption rate during test \_\_\_\_\_

If pumps affect test, indicate pumps operating \_\_\_\_\_

A<sub>1</sub> A<sub>2</sub> A<sub>3</sub> A<sub>4</sub>

Flow hydrants: 2202

Size nozzle 2.5"

Pilot reading 80

Discharge coefficient (Total gpm): .9 (1500 gpm)

gpm \_\_\_\_\_

Static B 130 psi Residual B 100 psi

Projected results @ 20 psi Residual \_\_\_\_\_ gpm: or @ \_\_\_\_\_ psi Residual \_\_\_\_\_ gpm

Remarks \_\_\_\_\_

Location map: Show line sizes and distance to next cross-connected line. Show valves and hydrant branch size. Indicate north. Show flowing hydrants - Label A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub>. Show location of static and residual - Label B.

Indicate B Hydrant \_\_\_\_\_ Sprinkler \_\_\_\_\_ Other (Identify) \_\_\_\_\_

US 12/14/09

Building 2576 Essayons Way, Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

*Palmetto State Utility Services, Inc. 11/14/10 11:14:10 AM*



**Palmetto State**  
Utility Services, Inc.  
A Subsidiary of American States Utility Services, Inc.

### Hydrant Flow Test Report

Location Hall Street Date 09/14/10

Test made by Joey Williams, Doug Capell, Brian Johnson Time 1600

Representative of PSUS Hydrant #: 2116

Witness \_\_\_\_\_

State purpose of test USACE RFP - Design

Consumption rate during test \_\_\_\_\_

If pumps affect test, indicate pumps operating \_\_\_\_\_

A<sub>1</sub> A<sub>2</sub> A<sub>3</sub> A<sub>4</sub>

Flow hydrants: 2117

Size nozzle 2.5"

Pilot reading 65

Discharge coefficient (Total gpm): .9 (1350 gpm)

gpm \_\_\_\_\_

Static B 130 psi Residual B 98 psi

Projected results @ 20 psi Residual \_\_\_\_\_ gpm: or @ \_\_\_\_\_ psi Residual \_\_\_\_\_ gpm

Remarks \_\_\_\_\_

Location map: Show line sizes and distance to next cross-connected line. Show valves and hydrant branch size. Indicate north. Show flowing hydrants – Label A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub>. Show location of static and residual – Label B.

Indicate B Hydrant \_\_\_\_\_ Sprinkler \_\_\_\_\_ Other (Identify) \_\_\_\_\_

US 12/14/09

Building 2576 Essayons Way, Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

*Handwritten signature/initials at the bottom of the page.*







# APPENDIX

## E

IMSE-JAC-PWE-E

9 March 2011

MEMORANDUM FOR United States Army Corps of Engineers; ATTN: Nancy Hamilton

SUBJECT: Memorandum of Environmental Consideration (MOEC) to Construct a New Training Support Center (10-0031)

1. The Environmental Division (ENV) has reviewed the subject project. The project must be completed as described in the signed Record of Environmental Consideration (REC) (encl 1) and as shown on the map (encl 2).
2. This MOEC is not an approval to begin the project; it outlines environmental and natural resource requirements only, as follows:
  - a. A Storm Water Permit and Pollution Prevention Plan is required for this project. For specific requirements, contact Ed McDowell at 751-6853, [ed.mcdowell1@us.army.mil](mailto:ed.mcdowell1@us.army.mil), or Matt Holstein at 751-9504, [matthew.holstein@us.army.mil](mailto:matthew.holstein@us.army.mil).
  - b. All construction, renovation, and demolition projects require 50% minimum diversion of construction and demolition (C&D) waste, by weight, from landfill disposal. Contract specifications must include submission of a contractor's C&D Waste Management Plan. This plan must be approved by ENV prior to the start of site clearance. For additional information, contact Barbara Williams, ENV, at 751-6858.
  - c. Materials with recycled content must be used as much as possible. The U.S. Environmental Protection Agency web site ([www.epa.gov/cpg/about.htm](http://www.epa.gov/cpg/about.htm)) has the latest product list and specific recycled content requirements for each product. For additional information, contact Barbara Williams, ENV, at 751-6858.
  - d. The Energy Policy Act of 2005 requires Federal agencies to purchase Energy Star and Federal Energy Management Program (FEMP)-designated products. The U.S. Environmental Protection Agency database (<http://yosemite1.epa.gov/oppt/eppstand2.nsf>) provides links to contract language, specifications, and policies; environmental standards and guidelines; vendor lists of product brands; and other useful sources of information. For additional information, contact Barbara Williams, ENV, at 751-6858.
  - e. The contractor is responsible for managing hazardous substances IAW Federal, State, local, and military regulations. The Fort Jackson Hazardous Substance Management Plan (HSMP), dated January 2011, may be used for guidance. The HSMP is located at <http://www.jackson.army.mil/sites/garrison/docs/442>. The contractor is responsible for hazardous substance spill prevention, training, clean up, and reporting, and must comply with the Fort Jackson Spill Response Plan (page 15 of the HSMP). For additional information, contact Barbara Williams, ENV, at 751-6858.

Friday, May 27, 2011

IMSE-JAC-PWE-E

SUBJECT: Memorandum of Environmental Consideration (MOEC) to Construct a New Training Support Center (10-0031)

f. Yard waste and land-clearing debris must remain on-site or be taken to a compost or wood chipping facility; it may not be placed in a trash container. For additional information, contact Barbara Williams, ENV, at 751-6858.

g. All sewer and water line construction must be in compliance with the rules and regulations of the South Carolina Department of Health and Environmental Control (DHEC). If new water distribution lines or sewer collection lines are constructed other than service lines to the facility, a DHEC construction and operating permit may be required. For additional information contact Ed McDowell, ENV, at 751-6853.

h. Operation and maintenance of the Fort Jackson drinking water distribution system and the wastewater collection system has been contracted (privatized) to Palmetto States Utility Services (PSUS). All installation units and activities must contact PSUS at 790-7288 before any tie-on, add-on, replacement, alteration, or repairs to any component of the privatized utility system.

i. The proposed project area has been previously surveyed and contains no historic properties. The South Carolina State Historic Preservation Office concurs. If artifacts are discovered prior to or during construction, cease work in the subject area and contact Chan Funk, ENV, at 751-7153. Artifacts are Federal property and should not be collected or disturbed.

j. The proposed project site is the location of over thirty abandoned groundwater monitoring wells. Prior to construction, all monitoring wells will be located and flagged by ENV. During the construction phase of the project, all wells must be protected from damage, and if it becomes necessary to remove any of the monitoring wells, Lahiri Estaba, ENV, must be contacted at 751-7332.

k. The project will not adversely affect any known threatened/endangered plant or animal species, including the Red-cockaded woodpecker (RCW). Cantonment areas are excluded from the RCW Habitat Management Unit. In addition, there are no wetland issues. For additional information, contact Stanley Rikard, Wildlife Branch, at 751-5376.

l. Fort Jackson has implemented a Sustainability Management System (SMS) to proactively deal with environmental impacts of its processes, activities, and services while supporting mission requirements and building community relationships. All persons working on, for, or on behalf of Fort Jackson must be aware of the SMS policy (acronym "PALMS"), which is to promote continual improvement, always be in compliance, look to prevent pollution, manage sustainable programs, and sustain natural and cultural resources. Contractors and their subcontractors must receive SMS General Awareness Training and ensure that all goods and services do not deviate from the installation's SMS Policy, objectives, and targets. For SMS training or additional information, contact the SMS Coordinator at 751-9505.

IMSE-JAC-PWE-E

SUBJECT: Memorandum of Environmental Consideration (MOEC) to Construct a New Training Support Center (10-0031)

- m. According to AR 420-1, Army Facilities Management, proposed construction sites must be evaluated for potential site contamination and classified in one of three categories. The project building site is a Category II site: there is no known contamination, however, there remains potential that contamination may be encountered during construction. (encl 3)
3. The proposed project has been reviewed as required by the National Environmental Policy Act (NEPA) and AR 200-2 and is adequately covered under the Environmental Assessment of the Construction of a New Training Support Center, dated 3 March 2011. Requirements listed above must be followed to ensure compliance with applicable Federal and State environmental laws and regulations.
4. A new REC must be submitted if this project is modified or expanded in a manner that was not considered in this review or if the project has not been initiated within one year.
5. The plans for this proposed project must be submitted to the DPW-MPD to obtain site approval. For additional information, contact Bill Connolly, MPD, at 751-5047.
6. For additional information, contact Patrick Metts, ENV, at 751-4078 or [william.p.metts@us.army.mil](mailto:william.p.metts@us.army.mil).

Encl

for THOMAS L. ROBERTSON  
Director of Public Works

BURGHARDT, WALLACE, K. 1060863543

Friday, May 27, 2011

REC # 10-0031

## 1. Project Title

Training Support Center PN 71119

## 2. Proponent/Organization/POC (Name, address, phone number, and email address)

DPW-Master Planning - William Connolly, Engineering Operations Officer 2562 Essayons Way, Fort Jackson, SC 29207 Phc

## 3. How is this project being executed?

☐ DPW In House ☒ U.S. Army Corps of Engineers☐ Contractor ☐ Self Help Project☐ Other

4. Approximate date of when proposed action/project will be initiated: (Month/Year): Dec 1, 2010

5. Anticipated completion date and/or duration of proposed action: (Month/Year): Dec 15, 2011

6. Approval of REC required by date: (Month/Year): Dec 4, 2009

## 7. Routine Repair/Maintenance &amp; Small Construction Activities (Check all that apply):

☐ Tree Removal/Pruning? If so, how many trees to be removed:☒ New Construction☐ Interior building improvements (Renovations, demo walls, painting) Building and Room #☐ Replacement of Utilities☐ Roofing Materials Disturbance☐ Removing carpet☐ Replacing Tile☒ Soil/Land Disturbance☒ Disturbance of Ground Cover/Vegetation, Other Landscaping (plants, shrubs, adding gravel, etc.

If so, how many acres? 5

RECORD OF ENVIRONMENTAL CONSIDERATION (REC)  
CANTONMENT AREA PROJECTS  
Directorate of Public Works, Environmental Division (ENV)

## 8. Detailed description, Scope of Work (SOW) (Please explain any checked boxes):

It is proposed to construct a 94000 sq. ft. structure on the land bounded by Washington Rd. Hall St. and Forest St. to accommodate Training needs at Ft. Jackson. See attached sketch forwarded under separate cover.  
Construct a one story standard medium Training Aids Support Center (TSC). Primary facilities include the TSC, installation of intrusion detection system (IDS), building information systems and antiterrorism measures. Supporting facilities include electric service, water, sanitary sewer, and site preparation/improvements. Heating and air conditioning will be by self contained systems. Access for the disabled will be provided. Sustainable Design and Development (SDD) and Energy Policy Act of 2005 (EPAct05) features will be provided.

## 9. Provide a site specific map of the project area that shows the location relative to a prominent landmark such as a road or building.

PROPONENT  
SIGNATURE

CONNOLLY.WILLIAM.MICHAEL.1326342285

Digitally signed by CONNOLLY.WILLIAM.MICHAEL.1326342285  
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA,  
cn=CONNOLLY.WILLIAM.MICHAEL.1326342285  
Date: 2009.11.18 15:35:48 -05'00'

Submit

## TO BE COMPLETED BY THE ENV DIVISION

REC # 10-0031

Needs to be reviewed by: ☒ WB ☒ FB ☒ EMB

Date Received Dec 1, 2009

Review Suspense Date

Date REC Complete Mar 9, 2011

## 12. Reason for using Record of Environmental Consideration (choose one):

a. The proposed project is adequately covered in an EA/EIS entitled:

Construction of a New Training Support Center, dated 3 March 2011.

b. The proposed project is categorically excluded under the provisions of CX , 32 CFR Part 651, because:

13. Project approved by DPTMS: ☐ YES ☐ NO ☒ NASignature  
Director, DPTMS

Friday, May 27, 2011

RECORD OF ENVIRONMENTAL CONSIDERATION (REC)  
CANTONMENT AREA PROJECTS  
Directorate of Public Works, Environmental Division (ENV)

Signature: National Environmental  
Policy Act Coordinator,  
Environmental Management Branch

<b>METTS.WILLIAM.P.1294488428</b>	Digitally signed by METTS.WILLIAM.P.1294488428 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=CONTRACTOR, cn=METTS.WILLIAM.P.1294488428 Date: 2011.03.09 13:54:36 -05'00'
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Signature: Branch Chief,  
Environmental Management Branch

<b>WILLIAMS.BARBARA.S.1229241784</b>	Digitally signed by WILLIAMS.BARBARA.S.1229241784 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=WILLIAMS.BARBARA.S.1229241784 Date: 2011.03.10 07:23:15 -05'00'
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IMSE-JAC-PWE-E

11 March 2011

## MEMORANDUM FOR Record

SUBJECT: Construction Site Environmental Survey (CSES) for a Training Aids Support Center

1. The proposed site for Site 1 is the tract of land between Washington Road and Hall Street, north of Building 1558.
2. A review of the following documents and reports did not reveal evidence that the proposed construction sites are contaminated or that there was a release of hazardous material on the sites. The information in this CSES for the site was initially covered in a CSES dated 2 August 2010 for a new Training Support Center proposed for that site.
  - a. Final Site Inspection Report, Fort Jackson, South Carolina; Military Munitions Response Program, Malcolm Pirnie Inc., 2007.
  - b. Letter from South Carolina Department of Health and Environmental Control (DHEC) Division of Waste Management, Corrective Action Engineering Section; Reporting Planned Changes AOC D, July 30, 2007.
  - c. Underground Storage Tank (UST) Disposition File, Fort Jackson Environmental Management Office.
  - d. Numerical Listing of Facilities, Fort Jackson Real Property Office, July 1975, 1976, & 1981.
  - e. Building Information Schedule, Fort Jackson Real Property Office, September 1981.
  - f. Aerial photos taken in 1945, 1947, 1959, 1970, 1974, 1980, 1989, and 1999.
3. The proposed building site was part of the World War II cantonment area. The area consisted of a laundry facility, a motor repair shop, a fueling station, a gas and oil station, a general warehouse, and a boiler house. The site remained as such until all buildings were demolished in the 1990s. The site has since remained a grassy area with small pine saplings.
4. According to DPW Environmental Management Branch records, 15 USTs were located on the site. They consisted of twelve 12,000 gallon USTs and one 10,000 gallon UST located in the vicinity of the former fueling station, Building 1545. In addition, two 5,000 gallon USTs were located on the site that served the small gas and oil station, Building 1565. All tanks had been removed by 1993. However, according to a closure report dated March 20, 1991 from Laidlaw Environmental Services, Inc, two 2,000 gallon USTs in the vicinity of Building 1565 were contracted to be removed but were never located. These tanks were also listed on the Environmental Division's tank inventory. At this time, the existence and/or location of the two 2,000 gallon USTs is unknown. Soil samples collected for the tank removal for Building 1545 indicated the presence of petroleum hydrocarbon contamination. Soil samples collected at the time of the tank removal for Building 1565 yielded results ranging from 1-45 parts per billion for benzene, toluene, ethylbenzene and xylene (BTEX) and 75-158 part per million for total

Friday, May 27, 2011



IMSE-JAC-PWE-E (200-2)

SUBJECT: Construction Site Selection Survey (CSES) for a Training Aids Support Center

petroleum hydrocarbon (TPH). Following the tank removal, monitoring wells were established to provide long term sampling of the groundwater for the presence of BTEX and TPH. Analytical data has since shown the decrease in these contaminants and, in 2009, DHEC granted a "No Further Action", NFA, status for the site. The proposed project site is the location of over thirty abandoned groundwater monitoring wells. Prior to construction, all monitoring wells will be located and flagged by the Environmental Division (ENV). During the construction phase of the project, all wells must be protected, and if it becomes necessary to remove any of the monitoring wells, Lahiri Estaba, ENV, must be contacted at (803) 751-7332.

5. Site surface inspections conducted on 2 August 2010 did not reveal visual evidence of environmental contamination.

6. According to AR 420-1, Army Facilities Management, proposed construction sites must be evaluated for potential site contamination and classified in one of three categories. The project building site is a Category II site: there is no known contamination; however, there remains the potential that contamination may be encountered during construction.

7. For additional information, contact Patrick Metts at (803) 751-4078 or [william.p.metts@us.army.mil](mailto:william.p.metts@us.army.mil).

METTS WILLIAM P. 1294488428

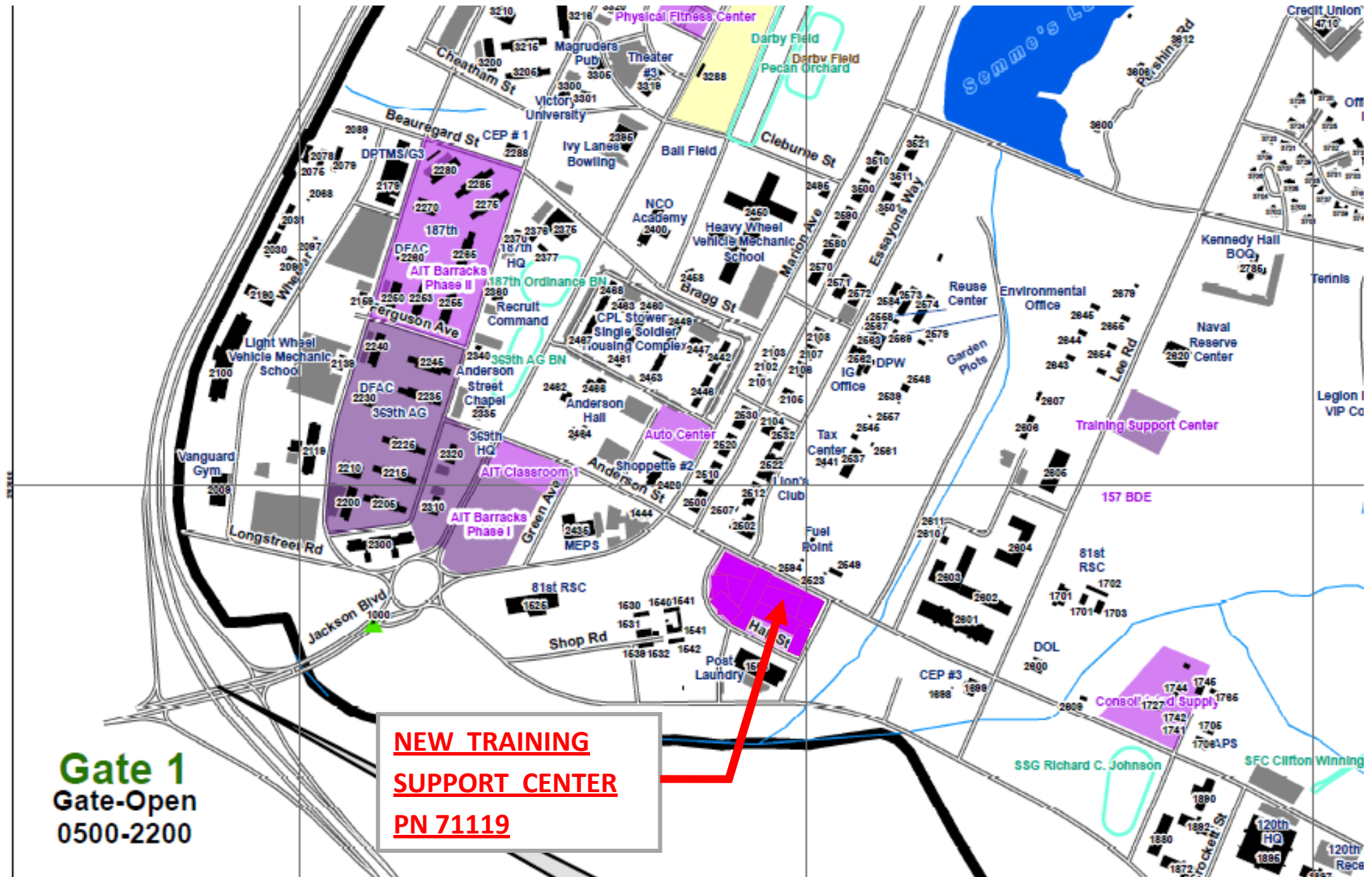
PATRICK METTS  
NEPA Coordinator  
Environmental Management Branch

WILLIAMS BARBARA S. 1229241784

BARBARA WILLIAMS  
Chief,  
Environmental Management Branch  
Environmental Division



LAHIRI ESTABA, P.G.  
Environmental Restoration Program Manager  
Environmental Division



# APPENDIX

## F

This appendix is not used. Refer to Installation Design Guide, located in Appendix DD for exterior colors and materials.

## APPENDIX G GIS Data

Not Used

## **Appendix H**

### **Exterior Signage**

## **APPENDIX H**

### **Exterior Signage**

#### **General Information**

The following series of signs and specifications has been developed specifically taken from TM5-807-10, *Signage*, H.Q.D.A. December 1983, and from the recently developed TRADOC Regulation No. 420-14, Facilities Engineering Exterior Sign Standards. Several of the signs shown in the following system have been designed for this Post, are not shown in either of the sources listed, and are unique to this installation. Several other signs in this system are to replace signs shown in either or in both sources, such as the sign for naming streets. The system of signs shown in this design guide shall take precedence over all other sources, technical manuals or regulations. This system is however, restricted to the typical basic signs normally needed on Post and there may be a need for a sign type or size that is not shown in this guide. When such a case occurs, or when the design, construction, or placement information presented herein is not sufficient, additional information is to be taken first, from TRADOC Regulation No. 420-14 and second from TM5-807-10

#### **Colors and Materials**

All colors to be used are taken from standards developed by the Federal Administration, and include the equivalent Federal Standard 595a number as well as the Pantone Matching System number, which can be found in the Appendix in the Color Index. All signs shall be standard white vinyl die-cut letters on standard brown baked enamel aluminum posts, unless otherwise noted. Alkyd, epoxy or urethane enamels may be used. Reflective or vinyl sheeting and reflective graphics on reflective sheeting may be used when approved by the D.E.H. Steel, polycarbonate or exterior plywood sign panels and steel or wood sign posts may be used when approved by the D.E.H.

#### **Traffic Symbols**

All traffic signs and symbols shall conform to those designated in the manual "Uniform Traffic Control Devices 1978 by the U.S. Department of Transportation Federal Highway Administration.

#### **Illumination**

All signs may be illuminated with non glare light sources that are not apparent in daylight hours such as indirect or below grade weather proof lights. Light shall be restricted to the sign panel only and shall be evenly distributed.

**MASTER PLAN.** In order to assure that all installation signage communicates clearly in an efficient and systematic way, it is strongly recommended that an Installation or Small Area sign master plan be prepared. This plan should show the location and content of every proposed exterior identification, guide, mandatory/prohibitory, and informational sign on the Installation. The plan consists of two parts, the sign location plan and the sign schedule.

A. Sign Location Plan. The sign location plan should be prepared using a current site plan of the Installation showing all structures and other major features. To prepare a sign location plan, determine the message content, sign type, and preliminary location of each required sign. Field verify the preliminary locations, and if necessary modify the locations to accommodate existing conditions. Assign and record a sequential number for each sign on the sign location plan.

B. Sign Schedule. After preparation of the sign location plan, a sign schedule should be prepared indicating all signs required or proposed using the assigned location numbers.

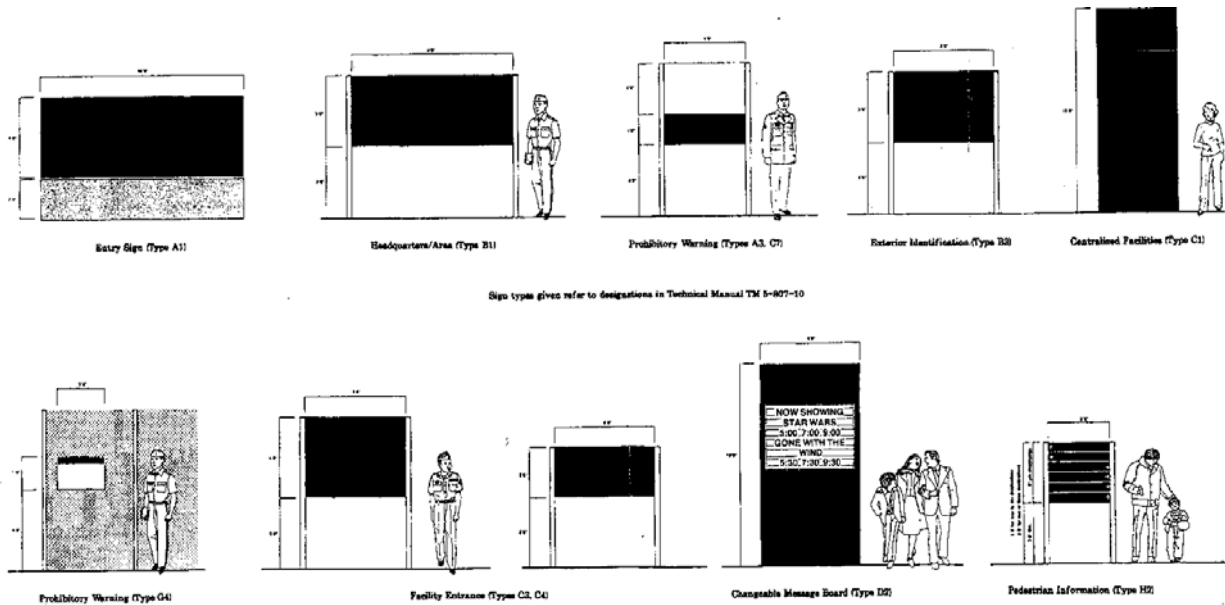
The system is comprised of a logical progression of sign types which guide travel to activities or facilities through orientation to major routes within the Installation and identification of each destination. The basic sequence consists of

- Identification of the Installation.
- Notification of security enforced on the Installation.
- Identification of the major units stationed at the Installation.
- Orientation to the site.
- Direction to destinations via street names and addresses.
- Identification of destinations.

This progression of signs is supplemented as required with informational, motivational, and mandatory/prohibitory signage. Consistent and widely understood nomenclature must be used on all signs to avoid confusion. Colors to be used are to be standard brown (30099) for sign boards with white (27875) die-cut reflective letters except where otherwise noted.

EMBLEMS Standard colors for Army signage are listed in tables 2-1 and 2-2. Colors for military emblems must be in accordance with The Institute of Heraldry, US Army, HQDA (DAAG-HDZ-A), Cameron Station, 5010 Duke Street, Alexandria, Virginia 22314, whose specifications utilize colors from the Standard color card of America, the Color Association of the United States, Inc. Branch colors are listed in table 2-1 in accordance with AR 670-1.

Standard colors developed for the Federal Highway Administration are utilized on guide and mandatory/prohibitory signs. Colors for safety are in accordance with AR-385-30. Paints, inks, and reflective sheeting materials used in the production of signs must match the standard colors.

**SIGN TYPES:****Typography**

Two typefaces are used in the signage system: Helvetica medium and Helvetica regular (with the exception of traffic control signs which follow guidelines in Standard Alphabets for Highway Signs and Pavement Markings published by the Federal Highway Administration). Since typefaces are not completely standardized in the printing and signage industries, any typeface being considered must be visually matched with examples shown:

- A. Helvetica Medium. Helvetica medium is the primary system typeface and is used for major information on all signs.

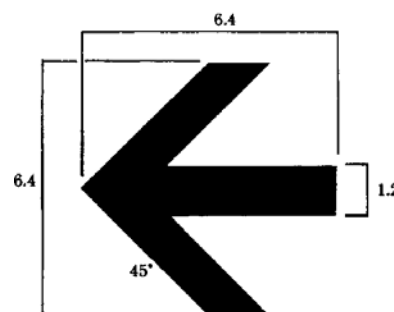
**ABCDEFGHIJKLMNOPQRSTUVWXYZ**  
**abcdefghijklmnopqrstuvwxyz**  
**1234567890\$G%/(&.,, ..,",,,;-) . .**

- B. Helvetica Regular. Helvetica regular is used for secondary information on signs and for translations of foreign languages using roman characters. Helvetica regular is never used in a situation requiring arrows.

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
 abcdefg hij klmnopq rst uvwxyz  
 1234567890\$C%/(&.;"',!"? =-~)



- C. **Letter Spacing.** Application of letters should be proportionately spaced to maintain visually equal spacing and alignment. Mechanically equal spacing will not be used.
1. **Letter Spacing Standards.** Letter spacing standards should be followed for both Helvetica medium and Helvetica regular typefaces. These standards are based on a unit system. Each unit is equivalent to 1/50th of the capital letter height.
  2. **Tiles Systems.** Adhesive-backed vinyl die.-cut letters supplied on proportionately sized paperboard tiles are an alternative letter spacing method. These tiles are notched to assure vertical alignment. The tiles are placed next to each other, lining up the alignment notches with the grid lines drawn on the sign face. Tile systems allow installation personnel to prepare professional quality signs with minimal training. Since letters are available individually, any message can be prepared as required, provided that an inventory of character tiles is maintained.
  3. **Pre-spaced system.** Adhesive-backed vinyl die-cut letters, pre-spaced and aligned on a transparent carrier sheet, are another alternative letter spacing method. This allows installation personnel to prepare professional quality signs quickly with minimal training. No inventory is required; however, lead time is necessary for manufacturers to prepare ordered messages.
- D. **Standard arrows.** All guide and informational signage intended for pedestrian use, either exterior or interior, must use the arrow shown.



E. **Layout Guidelines.**

1. Good judgment is the key to deciding where the lines should break in a sign message. Single ideas or names should appear on the same line, as follows:

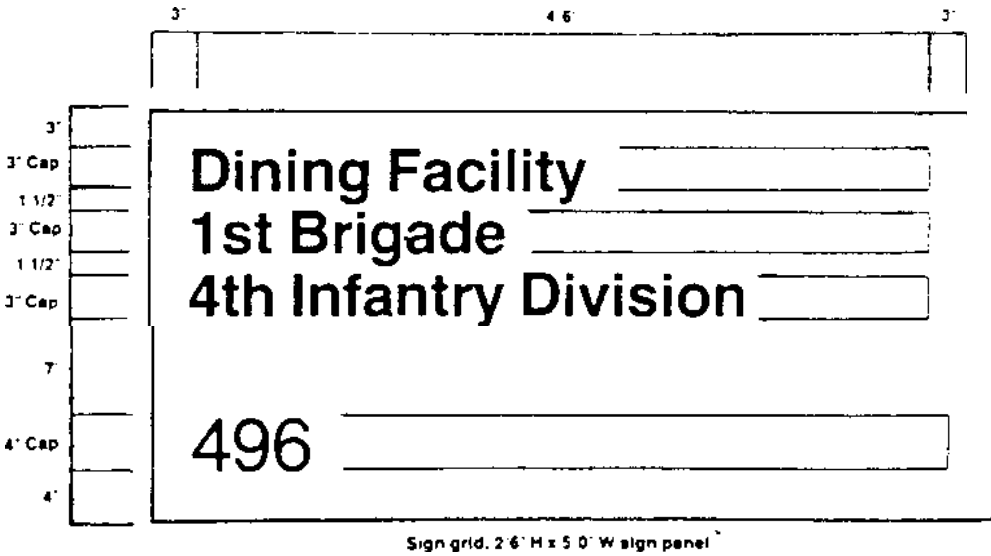
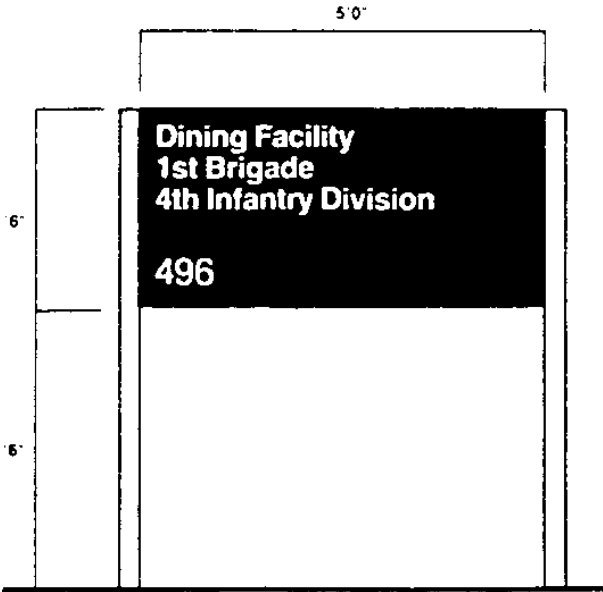
- a. Headquarters  
Fort McPherson
  - b. Not,  
Headquarters  
Fort McPherson
2. Names should be spelled out in full whenever possible, unless otherwise specified in the authorized unit name, as follows:
- a. 4th Infantry Division
  - b. 4th Battalion 61st ADA

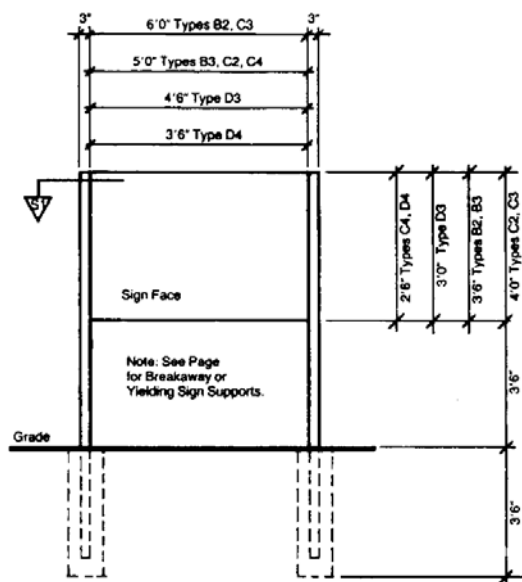
If abbreviations are required, they must be in accordance with *AR 310-50*.

3. Numbers should be used for the titles of military units except corps, which are designated by Roman numerals, and armies, which are spelled out in accordance with *AR 340-15*, as follows:
- a. Eighth US Army
  - b. 56th Artillery Brigade
4. Line breaks should be balanced, as follows:
- a. Material Development and Readiness Command
  - b. Engineering Plans/Real Property
  - c. United States Post Office
  - d. Authorized
  - e. Training and Doctrine Command

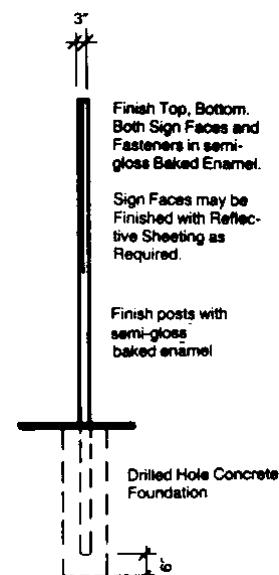
#### **Facility Entrance : Sign 'Types a, C4**

To be used at: Secondary centralized military and community facilities, primary military and community facilities, areas of warning, vehicular directional information, and for standard morale signs.

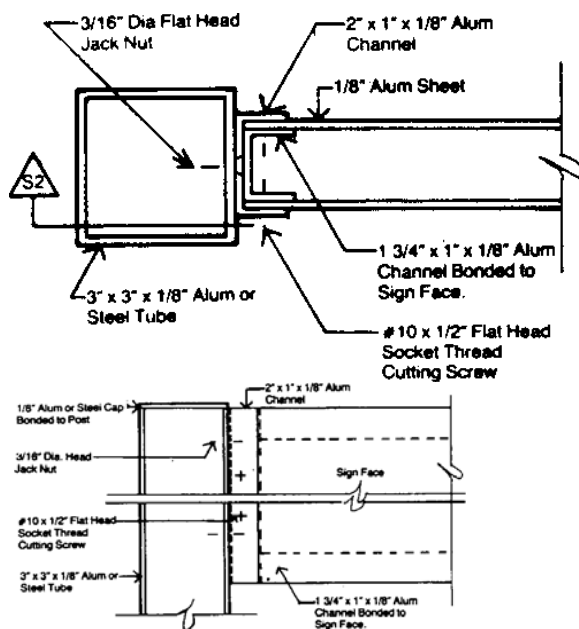




**Front Elevation: Sign Types 82.83,C 2, C3,C4.D3.  
Horizontal**



Section: S1

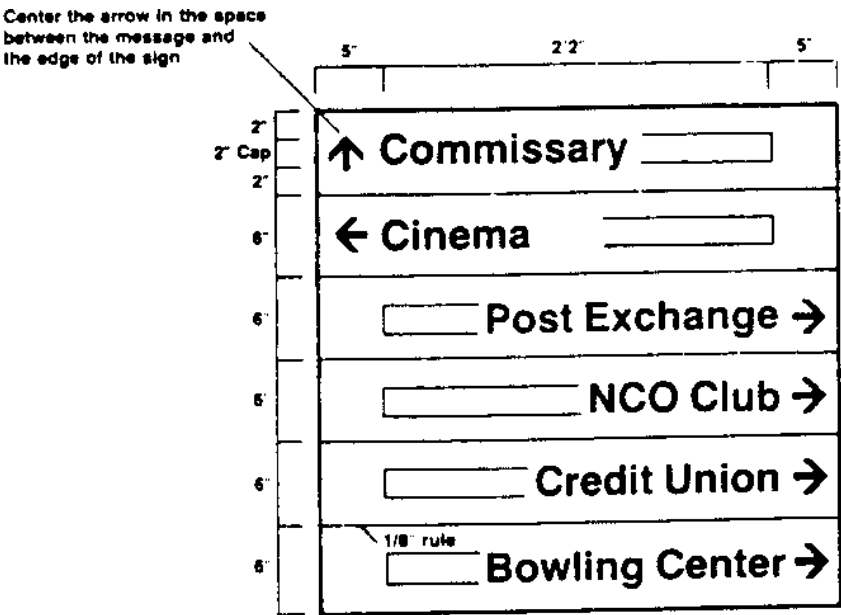
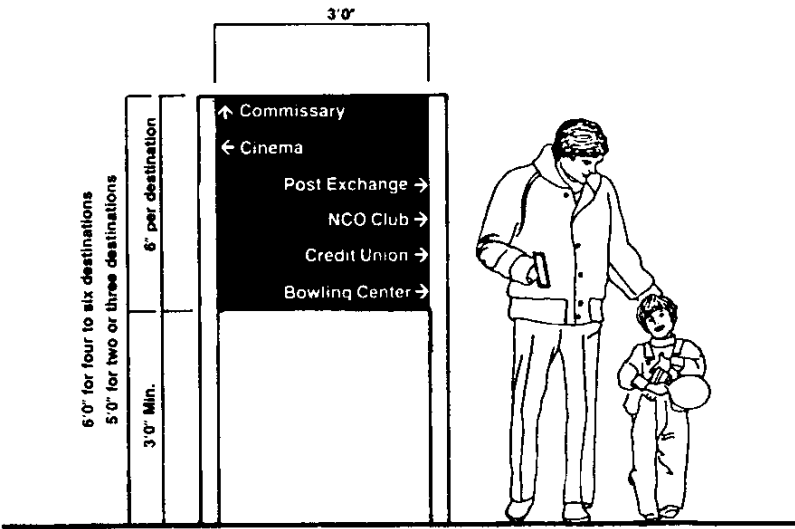


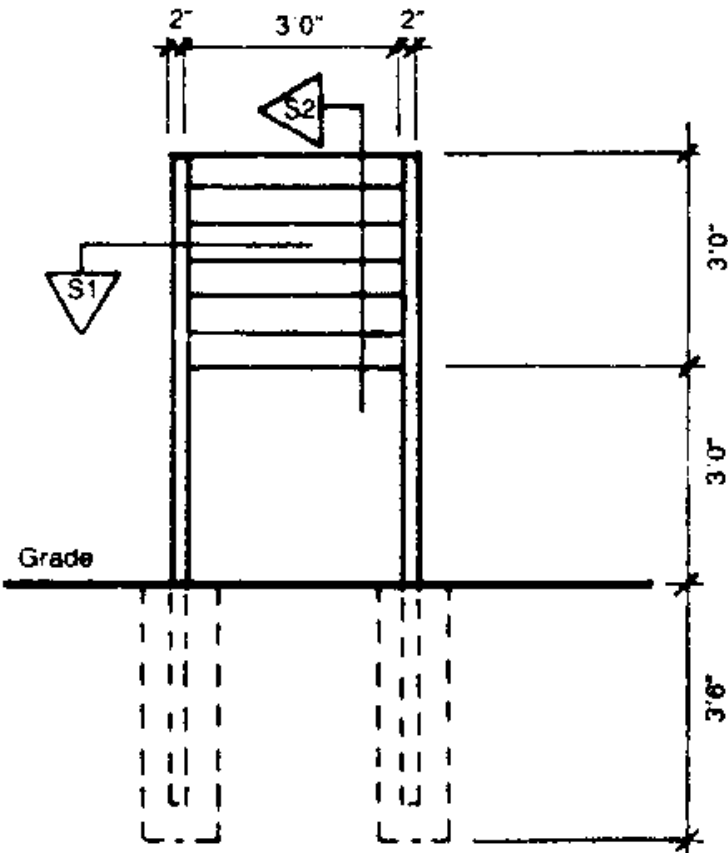
## Horizontal Section S2 Section

## Vertical

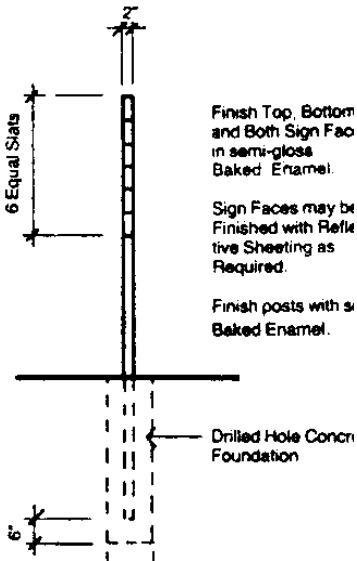
Pedestrian Information

To be used for pedestrian, and bicycles path directional information.





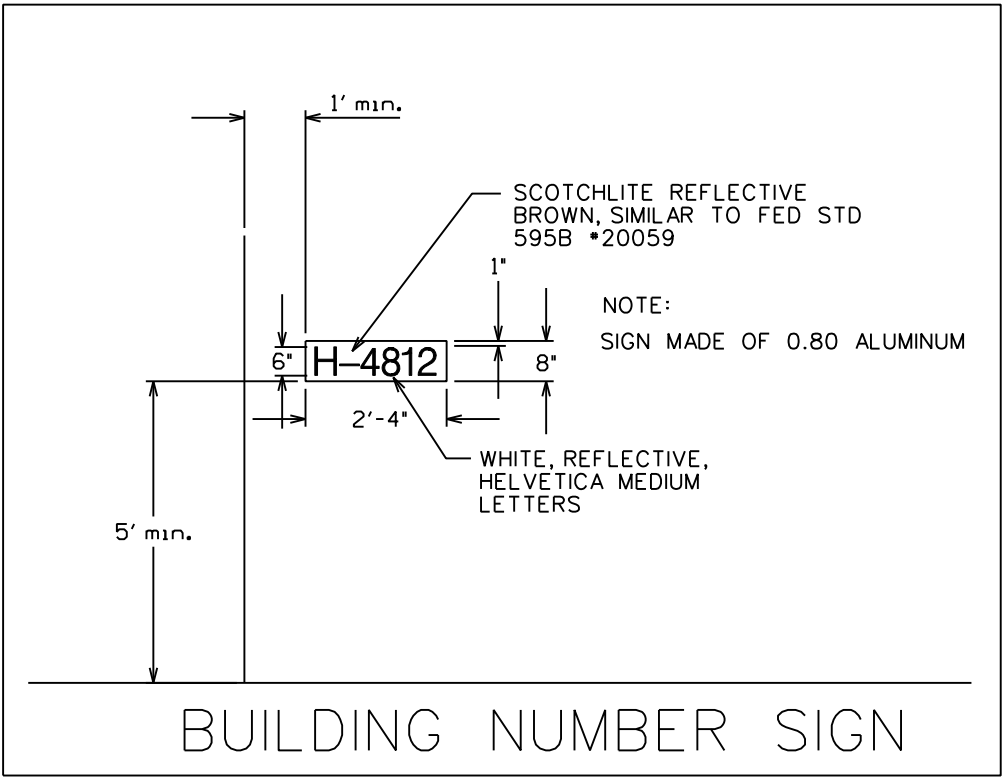
Front Elevation Sign Type H2



Section

SKETCH SHEET

BUILDING ADDRESS SIGNS



JOB		REFERENCED DRAWING NO. _____	SKETCH
		REFERENCED SHEET NO. _____	SK-G_ - 1_
SHEET TITLE	BUILDING ADDRESS SIGN _____	CONTRACT NO. _____	1_ OF 7_
		MODIFICATION NO. _____	DATE MAY 2000
		INVITATION NO. _____	DSGR
BASE	ET JACKSON S.C. ....	ADDED DY AMENDMENT NO. _____	_____



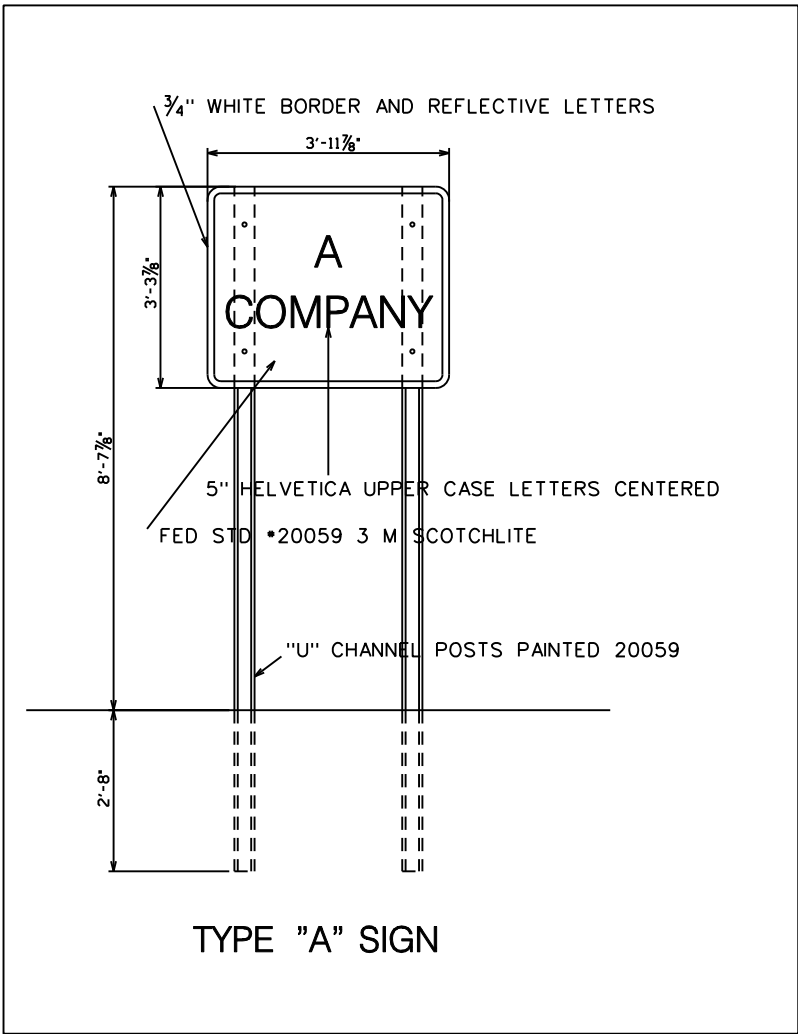


SKETCH SHEET

TYPE A SIGN

SPECIFICATIONS: TWO FEET SIX INCHES HIGH BY THREE FEET WIDE.  
FEDERAL STANDARD 595 COLOR BROWN (20059) ALUMINUM PANEL (HIGHWAY TYPE) WITH 3/4" WHITE BORDER AND WHITE REFLECTIVE LETTERS. THE SIGN IS MOUNTED ON TWO METAL "U" CHANNEL POSTS PAINTED BROWN 20059. TYPE FACE BE UPPER CASE "HELVITICA" AND CENTERED.

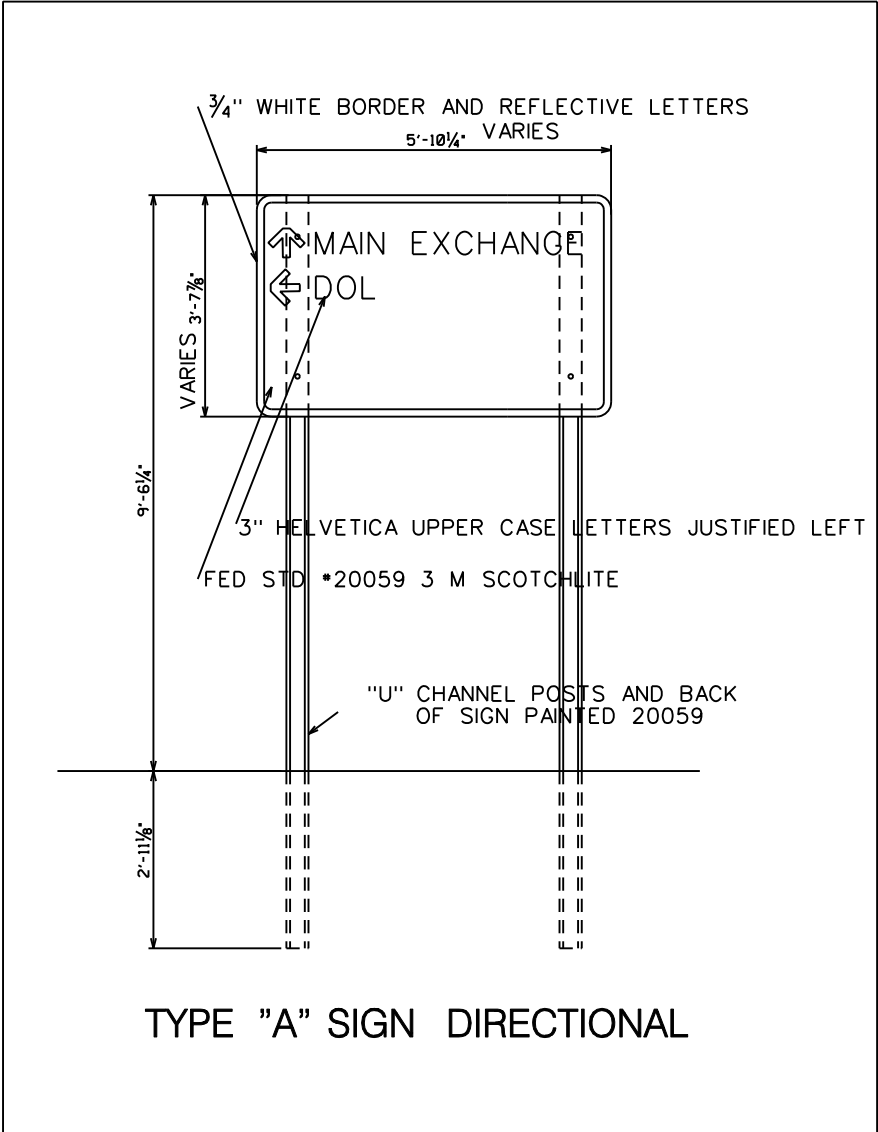
USES - COMPANY/BATTERY/DETACHMENT, DIRECTORATES, EDUCATION CENTERS AND ANNEXES, "G" LEVEL STAFF SECTIONS, MEDICAL AND HEALTH CARE FACILITIES (SMALL CLINICS), SPECIAL ADMINISTRATION OFFICES, RE-ENLISTMENT OFFICES, CLUBS IN TEMPORARY BUILDINGS, THRIFT SHOP, ARTS,AND CRAFTS, AUTO CRAFT SHOPS, MOTORCYCLE, SPORTS FIELD, HORSE STABLE, AND STADIUM.



JOB	UNIT / ORGANIZATION SIGN - TYPE A	REFERENCED DRAWING NO. _____	SKETCH
SHEET TITLE		REFERENCED SHEET NO. _____	SK-G-3
		CONTRACT NO. _____	3 OF 7
		MODIFICATION NO. _____	DATE MAY 2000
BASE		INVITATION NO. _____	DSGR
	FT. JACKSON S.C.	ADDED DY AMENDMENT NO. _____	_____

SKETCH SHEET

TYPE A SIGN



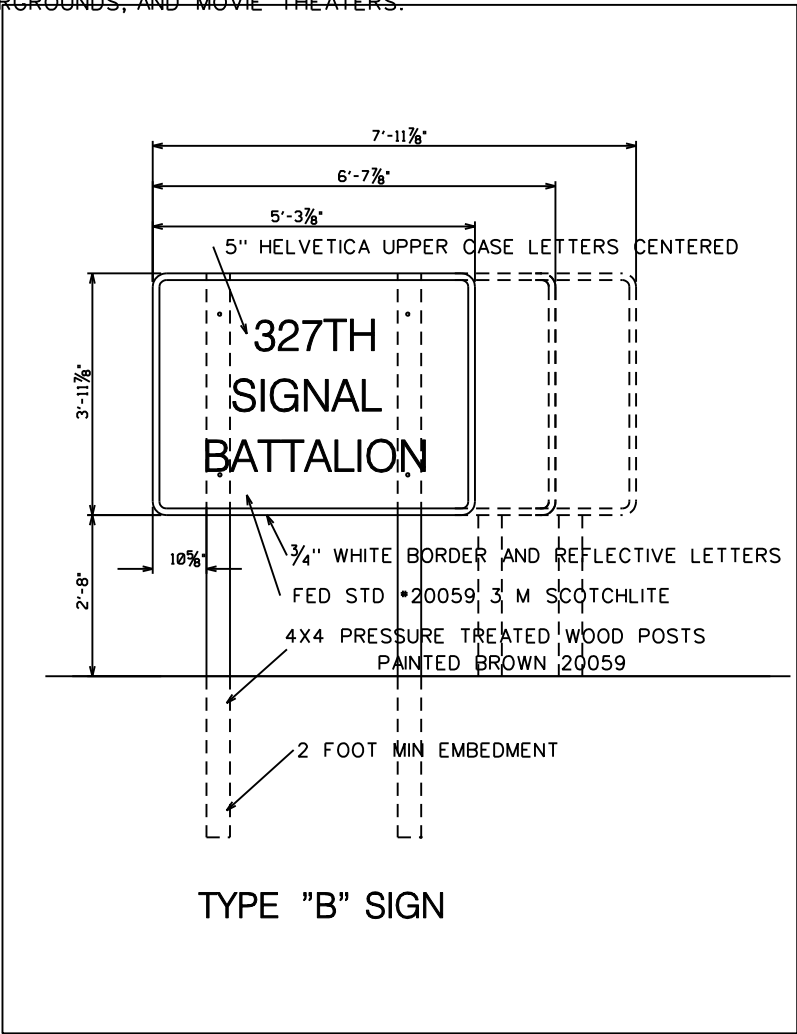
JOB		REFERENCED DRAWING NO. _____	SKETCH
		REFERENCED SHEET NO. _____	SK-G_ - 4_
SHEET TITLE	DIRECTIONAL_SIGN_____	CONTRACT NO. _____	4_ OF 7_
		MODIFICATION NO. _____	DATE MAY_2000_
BASE	E.I..JACKSON_S.C.....	INVITATION NO. _____	DSGR
		ADDED DY AMENDMENT NO. _____	_____

SKETCH SHEET

TYPE B SIGN

SPECIFICATIONS: THREE FEET HIGH BY FOUR FIVE OR SIX FEET WIDE. BROWN (20059) ALUMINUM PANEL (HIGHWAY TYPE) WITH 3/4" WHITE BORDER AND WHITE REFLECTIVE LETTERS. WIDTH IS DEPENDENT ON USAGE AND SITE RESTRICTIONS. THE SIGN IS MOUNTED ON TWO PRESSURE TREATED WOOD FOUR INCH BY FOUR INCH POSTS PAINTED BROWN 20059. TYPE FACE BE UPPER CASE "HELVITICA" AND CENTERED.

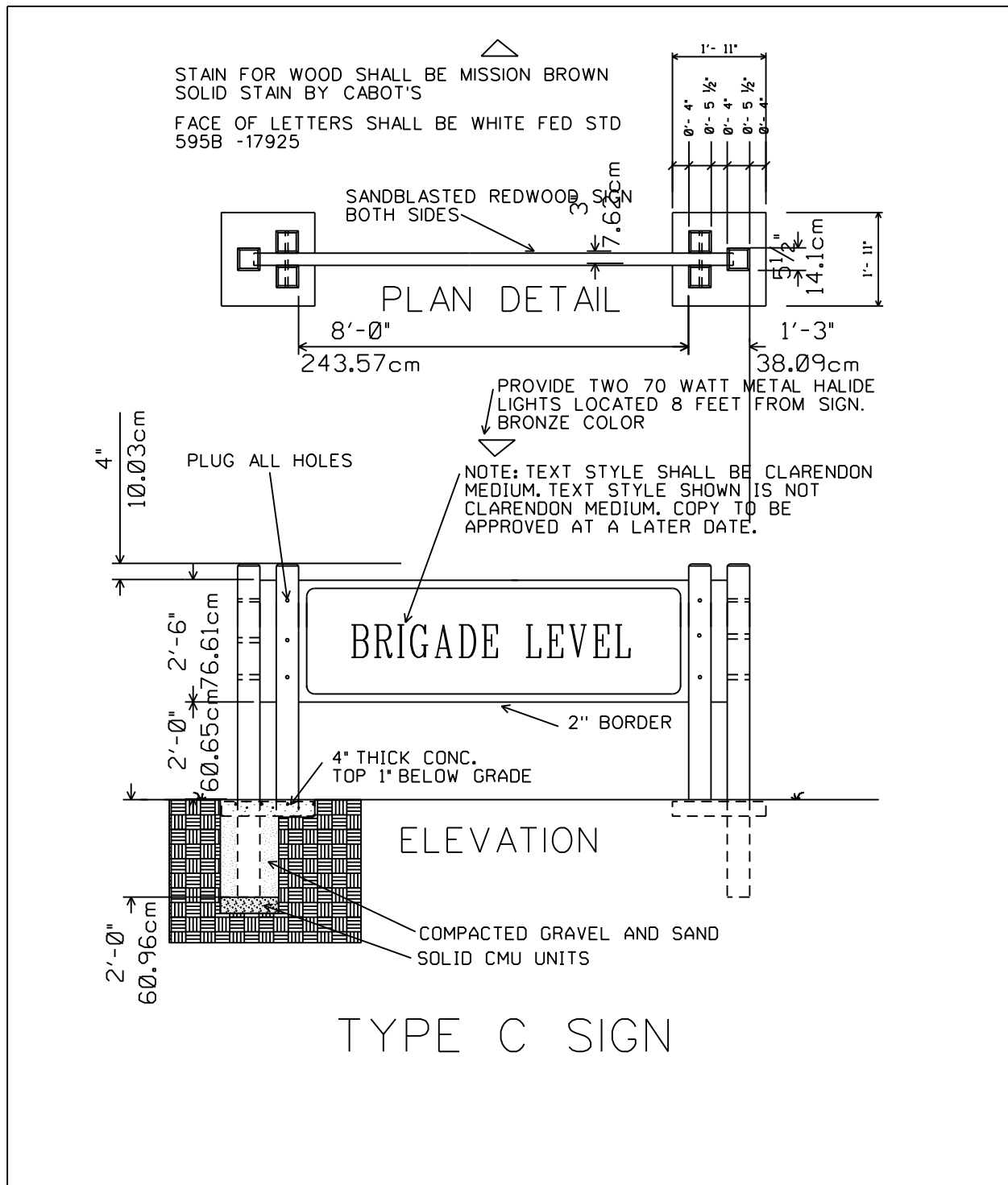
USES - BATTALION LEVEL COMMANDS, OFFICES AND ACTIVITIES FREQUENTED BY NON-FORT BRAGG PERSONNEL, DVERTISING/MOTIVATIONAL, FAIRGROUNDS, AND MOVIE THEATERS.



TYPE "B" SIGN

JOB	UNIT / ORGANIZATION SIGN - TYPE B	REFERENCED DRAWING NO. _____	SKETCH
SHEET TITLE		REFERENCED SHEET NO. _____	SK-G - 5
		CONTRACT NO. _____	5 OF 7
		MODIFICATION NO. _____	DATE MAY 2000
BASE		INVITATION NO. _____	DSGR
	ET. JACKSON S.C. ....	ADDED DY AMENDMENT NO. _____	_____

## SKETCH SHEET



JOB		REFERENCED DRAWING NO. _____	SKETCH
SHEET	UNIT / ORGANIZATION	REFERENCED SHEET NO. _____	SK-G-6
TITLE	SIGN TYPE C	CONTRACT NO. _____	6 OF 7
		MODIFICATION NO. _____	DATE MAY 2000
		INVITATION NO. _____	DSGR
BASE	E.I. JACKSON S.C.	ADDED BY AMENDMENT NO. _____	_____

SKETCH SHEET

SPECIFICATIONS - TWO FEET-SIX INCHES HIGH BY EIGHT FEET WIDE REDWOOD PANEL WITH A TWO INCH SMOOTH BORDER AND SANDBLASTED RAISED WHITE REFLECTIVE LETTERS. THE SIGN IS MOUNTED ON SIX INCH BY SIX INCH, REDWOOD POSTS, THREE ON EACH END. TYPE FACE SHALL BE "CLARENDON MEDIUM" AND CENTERED. STAIN COLOR SHALL BE "MISSION BROWN" BY CABOT STAINS (FED STD 595B 20059)

USES - BRIGADE/GROUP/REGIMENT, "FLAG LEVEL" UNITS, MEDICAL AND HEALTH CARE FACILITIES (LARGE CLINICS), CHILD CARE CENTERS, LIBRARIES, SHOOOLS, PHYSICAL FITNESS CENTERS, MEMORIALIZATION SIGNS, BANKS, MUSEUMS, AND PARADE FIELDS.

TYPE C SIGN

JOB	UNIT / ORGANIZATION SIGN -- TYPE C SPECS --	REFERENCED DRAWING NO. _____	SKETCH
SHEET TITLE		REFERENCED SHEET NO. _____	SK-G_ - Z_ Z_ OF Z_
		CONTRACT NO. _____	DATE MAY_2000_
BASE		MODIFICATION NO. _____	DSGR
	E.I. JACKSON S.C. ....	INVITATION NO. _____	_____
		ADDED DY AMENDMENT NO. _____	























**A Company  
2nd Battalion  
39th Infantry Regt**

**10402**

Commander

**CPT FLANERY**

First Sergeant

**1SG MARTINEZ**



# APPENDIX

## I

# DRAFT PLANTING LIST

DESCRIPTION					CULTURE					USE					
Growth rate: Fast	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Spreading	Exposure: Sun	Semi-Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Soil Fertility: Medium	Environmental: Erosion	Transitional/Natural

Botanical Name	Common Name														
* Axonopus affinis Carpet Grass	■	■				■			■	■		■	■	■	■
* Cynodon dactylon Bermudagrass **	■		■	■		■	■		■	■	■	■	■	■	■
* Lolium multiflorum Annual Ryegrass	■	■				■	■	■	■			■	■	■	■
* Wildflower Seed Mix ***					■									■	■

\* Centipede Grass - *Eremochloa ophiuroides*

\*\* Or suitable hybrids of Bermuda, including Tihay (Tifton 419)

\* Bahia Grass - *Paspalum notatum*

\*\*\* All wildflower seed mixtures to contain 40% annuals, 20% biennials, and 40% perennials with a mixture of spring, summer and fall blooming species using a minimum of 12 species. Mixture can be adapted for erosion control, shade tolerance and/or height restrictions.

End of Appendix I

\* DENOTES APPROVED PLANT/TREE

Revised  
10 May 10  
W. Ken Burghardt  
751-7702

12

RECEIVED FROM  
P. METTS (ENV)  
27 APR 10

B.C.

DRAFT - Subject to Revision

Monday, April 05, 2010

Friday, May 27, 2011

## Section: APPENDIX I

[Not Supplied]  
Page 207 of 636Vines:

DESCRIPTION										CULTURE										USE								
Group: Evergreen																												
Deciduous																												
Growth rate: Fast																												
Moderate																												
Texture: Coarse																												
Medium																												
Fine																												
Flowering: Yes																												
Form: Spreading																												
Exposure: Sun																												
Semi-Shade																												
Shade																												
Moisture Requirement: High																												
Medium																												
Low																												
Well-drained																												
Pest/Disease: Subject																												
Not Subject																												
Soil Fertility: High																												
Medium																												
Low																												
Environmental: Erosion																												
Shade																												
Transitional/Natural																												
Visual: Ornamental																												
Screen-Tall																												
Screen-Low																												

Botanical Name																												
Common Name																												
<del>Ampelopsis</del> <del>brevipedunculata</del> Ampelopsis																												
Campis radicans Trumpet creeper																												
Clematis sp. Clematis																												
Gelsemium sempervirens Carolina Jessamine																												
<del>Nedera helix</del> English Ivy																												
Lonicera sp. Honeysuckle																												
Vitis sp. Grape																												
Rosa hybrida Climbing Rose																												
Parthenocissus quinquefolia Virginia Creeper																												

Turf:

	DESCRIPTION										CULTURE										USE																										
	Group	Evergreen	Deciduous	Growth rate	Fast	Moderate	Slow	Texture	Coarse	Medium	Fine	Flowering	Yes	Form	Horizontal	Pyramidal	Irregular	Upright	Spreading	Exposure	Sun	Semi-Shade	Shade	Moisture Requirement	High	Medium	Low	Well-drained	Pest/Disease	Subject	Not Subject	Soil Fertility	High	Medium	Low	Environmental	Erosion	Shade	Transitional/Natural	Visual	Ornamental	Screen-Tall	Screen-Low				
Botanical Name																																															
Common Name																																															
<i>Pachysandra terminalis</i>	■			■		■		■										■				■		■						■	■	■	■	■			■										
Japanese Spruce																																															
<i>Vinca major</i>	■		■					■		■		■					■	■	■	■	■	■	■				■			■					■	■	■	■	■	■	■	■	■				
Periwinkle																																															
<i>Vinca minor</i>	■		■					■		■		■						■					■					■			■					■	■	■	■	■	■	■	■	■			
Periwinkle																																															
<i>Euonymus fortunei 'radicans'</i>	■			■							■									■	■	■	■	■				■						■			■	■	■	■	■	■	■				
Wintercreeper																																															
<i>Phlox subulata</i>	■			■				■	■										■	■	■	■	■	■				■						■	■	■	■	■	■	■	■	■	■				
Thrift																																															

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[Not Supplied]

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	DESCRIPTION												CULTURE					USE																
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall
Botanical Name																																		
Common Name																																		
<i>Forsythia</i> sp. Golden Bells																																		
<i>Ilex cornuta</i> <i>burfordi</i> Burford Holly																																		
<i>Ilex cornuta</i> <i>rotunda</i> Chinese Holly																																		
<i>Ilex crenata</i> <i>compacta</i> Japanese Holly																																		
<i>Ilex crenata</i> <i>'Helleri'</i> Heller Japanese Holly																																		
<i>Ilex crenata</i> <i>microphylla</i> Japanese Holly																																		
<i>Ilex vomitoria nana</i> Yaupon Holly																																		
<i>Juniperus</i> sp. Juniper																																		
<i>Ligustrum</i> sp. Privet																																		



## Section: APPENDIX I

DESCRIPTION	CULTURE	USE
Deciduous		
Growth rate: Fast		
Moderate		
Slow		
Texture: Coarse		
Medium		
Fine		
Flowering: Yes		
Form: Horizontal		
Rounded		
Oval		
Irregular		
Upright		
Spreading		
Weeping		
Exposure: Sun		
Semi-Shade		
Shade		
Moisture Requirement: High		
Medium		
Low		
Well-drained		
Pest/Disease: Suscept		
Not Suscept		
Soil Fertility: High		
Medium		
Low		
Environmental: Erosion		
Shade		
Transitional/Natural		
Visual: Street Trees		
Ornamental		
Screen-Tall		
Screen-Low		

[illegible]

Section: APPENDIX I

DESCRIPTION																	CULTURE							USE														
Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low		
Common Name																																						
Quercus coccinea Scarlet Oak																																						
Quercus falcata Southern Red Oak																																						
Quercus nigra Water Oak																																						
Quercus palustris Pin Oak																																						
Quercus phellos Willow Oak																																						
Quercus stellata Post Oak																																						
Quercus virginiana Live Oak																																						
Sassafras albidum Sassafras																																						
Salix nigra Black Willow																																						
Zelkova serrata Zelkova																																						

Shrubs:

DESCRIPTION																	CULTURE							USE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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## Section: APPENDIX I

[Not Supplied]  
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		DESCRIPTION											CULTURE					USE																							
		Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Suscept	Not Suscept	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low			
	Botanical Name Common Name																																								
*	<i>Diospyros virginiana</i> Persimmon																																								
	<i>Ginkgo biloba</i> Ginkgo																																								
	<i>Ilex decidua</i> Possumhaw																																								
*	<i>Ilex opaca</i> American Holly																																								
*	<i>Juniperus virginiana</i> Red Cedar																																								
*	<i>Lagerstroemia indica</i> Crape Myrtle																																								
*	<i>Liquidambar styraciflua</i> Sweetgum																																								
*	<i>Liriodendron tulipifera</i> Tulip Tree																																								
	<i>Magnolia grandiflora</i> Magnolia																																								

- \* Leyland Cypress - *Cupressocyparis leylandii*  
 \* Eastern Red bud - *Cercis canadensis*  
 \* Flowering Dogwood - *Cornus florida*

## Section: APPENDIX I

## APPENDIX I

### ACCEPTABLE PLANTS LIST

**Plant Material.**

The following charts are guides for the selection of plant material for new plantings on Post. Their purpose is to aid professionals in selecting hardy, durable plants that will withstand the type of maintenance available on Post. The lists provide a broad selection of plants that can be used for most design situations. However, within the Installation there are various microclimates that must be considered when choosing a species. Professional recommendations are to be reviewed and approved by qualified personnel on Post prior to installation. As regional climate fluctuates and new diseases and insects move into the area, certain plants may need to be eliminated from the lists. Likewise, as new plant varieties and species become available, the lists will need to be updated.

**Trees:**

	DESCRIPTION														CULTURE										USE															
	Group	Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Maintenance Requirement: High	Medium	Low	Well-drained	Pest/Disease Suscept	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Fall	Screen-Low		
Botanical Name																																								
Common Name																																								
Acer negundo Boxelder																																								
Acer rubrum Red Maple																																								
Acer saccharum Sugar Maple																																								
Aesculus pavia Red Buckeye																																								
Betula nigra River Birch																																								
Carya illinoensis Pecan																																								
Celtis laevigata Sugarberry																																								
Celtis occidentalis Hackberry																																								
Crataegus marshallii Hawthorn																																								



# APPENDIX

## J





# APPENDIX

## K

APPENDIX K  
Fuel Cost Information  
July 2010

The following utility rates for this installation are provided for design

**Electrical:**

Demand Charge - \$0.094 per kilowatt

**Natural Gas:**

Commodity Charge Rate - \$ 7.55 per thousand cubic feet

**Water:**

Commodity Charge Rate - \$2.07 per kgal

**Sewer:**

Commodity Charge Rate - \$1.13 per kgal

**Purchased/Central Steam:**

Commodity Charge Rate – N/A

**Purchased High Temperature Water:**

Commodity Charge Rate - \$11.71 per Mbtu

**Purchased Chilled Water:**

Commodity Charge Rate - \$10.72 per Mbtu

APPENDIX  
L

**APPENDIX L****LEED Project Credit Guidance (DEC 10)**

This spreadsheet indicates Army required credits, Army preferred credits, project-specific ranking of individual point preferences, assumptions guidance for individual credits, and references to related language in the RFP for individual credits.

	LEED Credit Paragraph		Army Guidance: Required - Preferred - Avoid	Project Preference Ranking: (1=most preferred, blank=no preference, X=preference not applicable to this credit, Rqd=required)	
		LEED Project Credit Guidance			
PAR		FEATURE			REMARKS
<b><u>SUSTAINABLE SITES</u></b>					
SSPR1		Construction Activity Pollution Prevention (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
SS1		Site Selection		X	See paragraph LEED CREDITS COORDINATION.

SS2	Development Density & Community Connectivity - OPTION 1 DENSITY		X	See paragraph LEED CREDITS COORDINATION.
	Development Density & Community Connectivity - OPTION 2 CONNECTIVITY		X	See paragraph LEED CREDITS COORDINATION.
SS3	Brownfield Redevelopment		X	See paragraph LEED CREDITS COORDINATION.
SS4.1	Alternative Transportation: Public Transportation Access		X	See paragraph LEED CREDITS COORDINATION.
SS4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	Pref		Assume that non-transient building occupants are NOT housed on Post unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 1			Requires provision of vehicles, which cannot be purchased with construction funds. Assume Government will not provide vehicles unless indicated otherwise. Assume that 50% of GOV fleet is NOT alternative fuel vehicles unless indicated otherwise.
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 2	Pref		
SS4.3	Alternative Transportation: Low Emitting & Fuel Efficient Vehicles - OPTION 3			Requires provision of vehicle refueling stations. Installation must support type of fuel and commit to maintaining/supporting refueling stations.
SS4.4	Alternative Transportation: Parking Capacity	Pref		

SS5.1	Site Development: Protect or Restore Habitat			
SS5.2	Site Development: Maximize Open Space	Pref		Assume AGMBC option for aggregated open space at another location on the installation is not available to the project unless indicated otherwise.
SS6.1	Stormwater Design: Quantity Control	Pref		See paragraph STORMWATER MANAGEMENT.
SS6.2	Stormwater Design: Quality Control	Pref		See paragraph STORMWATER MANAGEMENT.
SS7.1	Heat Island Effect: Non-Roof			
SS7.2	Heat Island Effect: Roof	Pref		Coordinate with nearby airfield requirements, which may preclude this credit.
SS8	Light Pollution Reduction	Pref		
<b><u>WATER EFFICIENCY</u></b>				
WEPR1	Water Use Reduction (Version 3 only)	Rqd	Rqd	All LEED prerequisites are required to be met.
WE1.1	Water Efficient Landscaping: Reduce by 50%	Pref		See paragraph IRRIGATION. Project must include landscaping to be eligible for this credit.
WE1.2	Water Efficient Landscaping: No Potable Water Use or No Irrigation	Pref		Project must include landscaping to be eligible for this credit.
WE2	Innovative Wastewater Technologies - OPTION 1			
WE2	Innovative Wastewater Technologies - OPTION 2			
WE3	Water Use Reduction	Pref		See paragraph BUILDING WATER USE REDUCTION.

<b>ENERGY AND ATMOSPHERE</b>				
EAPR1	Fundamental Commissioning of the Building Energy Systems (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR2	Minimum Energy Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EAPR3	Fundamental Refrigerant Management (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EA1	Optimize Energy Performance	Rqd	1	Earning of LEED EA1 points as indicated in paragraph <b>ENERGY CONSERVATION</b> , as a minimum, is required.
EA2.1	On-Site Renewable Energy	Pref		See paragraph <b>ENERGY CONSERVATION</b> .
EA3	Enhanced Commissioning	Rqd		See paragraph <b>COMMISSIONING</b> . The Commissioning Authority may be provided through the Design-Build Contractor only if in accordance with USGBC Credit Interpretation Ruling (CIR) dated 9/15/06. Commissioning Authority activities begin during design phase and continue well beyond beneficial occupancy. Assume Government will not provide CxA post-occupancy activities unless indicated otherwise.
EA4	Enhanced Refrigerant Management			
EA5	Measurement & Verification			Assume Government will not provide post-occupancy activities unless indicated otherwise.
EA6	Green Power		X	See paragraph <b>LEED CREDITS COORDINATION</b> .

<b>MATERIALS AND RESOURCES</b>				
MRPR1	Storage & Collection of Recyclables (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Coordinate with Installation during design development on collection service and receptacles.
MR1	Building Reuse			
MR2.1	Construction Waste Management: Divert 50% From Disposal	Pref		See paragraph CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT.
MR2.2	Construction Waste Management: Divert 75% From Disposal	Pref		
MR3	Materials Reuse			
MR4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	Pref		See paragraph RECYCLED CONTENT.
MR4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer)	Pref		
MR5.1	Regional Materials:10% Extracted, Processed & Manufactured Regionally			
MR5.2	Regional Materials:20% Extracted, Processed & Manufactured Regionally			



MR6	Rapidly Renewable Materials	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS and paragraph FEDERAL BIOBASED PRODUCTS PREFERRED PROCUREMENT PROGRAM.
MR7	Certified Wood	Pref		See paragraph BIOBASED AND ENVIRONMENTALLY PREFERABLE MATERIALS.
<b>INDOOR ENVIRONMENTAL QUALITY</b>				
EQPR1	Minimum IAQ Performance (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met.
EQPR2	Environmental Tobacco Smoke (ETS) Control (PREREQUISITE)	Rqd	Rqd	All LEED prerequisites are required to be met. Assume all buildings are smoke free unless indicated otherwise (family housing, barracks and other lodging are facility types where smoking may be permitted in some cases). Except where indicated otherwise, provide an outdoor designated smoking area (with signage but no structure) which will be at least 50 feet from common points of ingress/egress, building air intakes and operable windows. Designated smoking area will not be located in an area that is commonly used by nonsmokers.
EQ1	Outdoor Air Delivery Monitoring			
EQ2	Increased Ventilation			
EQ3.1	Construction IAQ Management Plan: During Construction	Pref		See paragraph CONSTRUCTION IAQ MANAGEMENT.
EQ3.2	Construction IAQ Management Plan: Before Occupancy	Pref		See paragraph CONSTRUCTION IAQ MANAGEMENT.

EQ4.1	Low Emitting Materials: Adhesives & Sealants	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.2	Low Emitting Materials: Paints & Coatings	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.3	Low Emitting Materials: Carpet/Flooring Systems	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ4.4	Low Emitting Materials: Composite Wood & Agrifiber Products	Pref		See paragraph LOW-EMITTING MATERIALS.
EQ5	Indoor Chemical & Pollutant Source Control	Pref		System requiring weekly cleaning to earn this credit is not a permitted option unless indicated otherwise.
EQ6.1	Controllability of Systems: Lighting			
EQ6.2	Controllability of Systems: Thermal Comfort			
EQ7.1	Thermal Comfort: Design	Rqd		See paragraph HEATING, VENTILATING AND AIR CONDITIONING.
EQ7.2	Thermal Comfort: Verification			Project must earn credit EQ7.1 to be eligible for this credit. Assume Government will not provide post-occupancy activities unless indicated otherwise.
EQ8.1	Daylight & Views: Daylight 75% of Spaces	Pref		See paragraph DAYLIGHTING.
EQ8.2	Daylight & Views: Views for 90% of Spaces	Pref		
<b>INNOVATION &amp; DESIGN PROCESS</b>				
IDc1.1	Innovation in Design			See paragraph INNOVATION AND DESIGN CREDITS. Assume Government will not provide any activities associated with ID credits.
IDc1.2	Innovation in Design			
IDc1.3	Innovation in Design			
IDc1.4	Innovation in Design			
IDc2	LEED Accredited Professional	Rqd	Rqd	LEED AP during design

				and construction is required.
REGIONAL PRIORITY CREDITS (Version 3 only)				See paragraph LEED CREDITS COORDINATION.

# APPENDIX

## M

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**Appendix M**

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# **Owner's Project Requirements Document for LEED Fundamental Commissioning**

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Project: Training Support Center, Fort Jackson, SC

Approved:

\_\_\_\_\_  
Name

\_\_\_\_\_  
Owner's Representative

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name

\_\_\_\_\_  
Design Agent's Representative

\_\_\_\_\_  
Date

---

## **Overview and Instructions**

The purpose of this document is to provide clear and concise documentation of the Owner's goals, expectations and requirements for commissioned systems, and shall be utilized throughout the project delivery and commissioning process to provide an informed baseline and focus for design development and for validating systems' energy and environmental performance.

The Owner's Project Requirements Document is a required document for LEED-NC EA Prerequisite Fundamental Commissioning of the Building Energy Systems. It shall be completed by the Corps District/Design Agent based on coordination with the Installation/User/Proponent and shall be approved by the Installation/User/Proponent representative.

The intent of the Owner's Project Requirements Document is to detail the functional requirements of a project and the expectations of the building's use and operation as it relates to commissioned systems. This template contains the basic recommended components indicated in the LEED Reference Guide. It should be adapted as needed to suit the project, remaining reflective of the LEED intent.

The Owner's Project Requirements Document should ideally be completed before the start of design and furnished to the design team. It must be completed prior to the approval of Contractor submittals of any commissioned equipment or systems to meet LEED requirements.

Updates to the Owner's Project Requirements Document throughout the course of project delivery shall be made by the Corps District/Design Agent based on decisions and agreements coordinated with and agreed to by the Installation/User/Proponent.

The Owner's Project Requirements Document shall be included in the project's LEED documentation file under EA PR1, Fundamental Commissioning of the Building Energy Systems.

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## **Owner's Project Requirements Document for LEED Fundamental Commissioning**

### **Table of Contents**

1. Owner and User Requirements
  - Primary Purpose, Program and Use
  - Project History
  - Broad Goals
2. Environmental and Sustainability Goals
  - Energy Efficiency Goals
  - General
  - Siting
  - Building Façade
  - Building Fenestration
  - Building Envelope
  - Roof
  - Other
3. Indoor Environmental Quality Requirements
  - Intended Use
  - Occupancy Schedule
  - Accommodations for After-Hours Use
  - Lighting, Temperature, Humidity, Air Quality, Ventilation, Filtration
  - Acoustics
  - Occupant Ability to Adjust System Controls
  - Types of Lighting
4. Equipment and Systems Expectations
  - Space Heating
  - Ventilation
  - Air Conditioning
  - Refrigeration
  - HVAC Controls
  - Domestic Hot Water
  - Lighting Controls
  - Daylighting Controls
  - Emergency Power
  - Other
5. Building Occupant and O&M Personnel Requirements
  - Facility Operation
  - EMCS
  - Occupant Training and Orientation
  - O&M Staff Training and Orientation

TABLE 1

04 MAY 10

## 1. **Owner and User Requirements**

What is the primary purpose, program and use of this project? (example: office building with data center)

This Training Support Center fabricates, maintains, stores and issues training devices. The facility contains warehouse space, shops, classrooms and administrative offices.

---

Describe pertinent project history. (example: standard design development)

This project is based on a standard design for Training Support Centers developed by USACE Huntsville. Due to the unique size and army wide fabrication mission of this Training Support Center, the typical standard design floor plan was adjusted to meet these unique requirements.

---

### **Broad Goals**

What are the broad goals relative to program needs?

The goal is to provide a durable, economical, energy efficient facility to meet the functional needs of the mission within the guidance and criteria set forth in this RFP.

---

What are the broad goals relative to future expansion?

Future expansion, if required, would be in the warehouse storage capacity. If expansion is needed, it is planned to be provided as a separate building on an adjacent site.

---

What are the broad goals relative to flexibility?

Functional uses within the Admin and training conditioned area may shift within those areas over time. The column layout in the warehouse area should provide long term flexibility for rack shelving arrangements.

---

What are the broad goals relative to quality of materials?

This facility should be designed and constructed to have a 50 year life span. Choose low maintenance, durable materials.

---

What are the broad goals relative to construction costs?

The government places value in methods that streamline construction, manage labor and other resource constraints in an effort to reduce costs and support an aggressive schedule, including such things as fast-tracking, using factory built modules or assemblies, panelization, pre-cast, tilt-up, standard designs, etc., while meeting contract and quality requirements.

---

What are the broad goals relative to operational costs?

Minimize operating costs as much as possible within first cost budget. Future energy costs are difficult to predict, but energy costs will not be less in the future. Energy efficiency and water use reduction are

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necessary to operate the facility in a cost effective manner. Meet EAct 2005 (reduced water, energy consumption).

## **2. Environmental and Sustainability Goals**

What are the project goals relative to sustainability and environmental issues? (example: LEED Silver rating)

The project goals relative to sustainability and environmental issues are to achieve LEED Silver rating. This facility will be submitted to the USGBC for certified LEED Silver.

---

What are the project goals relative to energy efficiency? (example: Meet EAct)

The project goals relative to energy efficiency are to meet EAct 2005 and to achieve an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHARE/IESNA Standard 90.1.

---

What are the project goals and requirements for building siting that will impact energy use?

The building orientation is somewhat confined by the size and shape of the building and the site. Locate fenestration elements to maximize daylight. Provide shading devices to minimize heat gain.

---

What are the project goals and requirements for building facade that will impact energy use?

Exterior appearance will vary to be compatible with adjoining environment's architectural theme. Special local requirements are indicated in Paragraph 6 of Section 01 10 00.

---

What are the project goals and requirements for building fenestration that will impact energy use?

Daylight is required in all occupied spaces and fenestration locations are shown on the facility floor plan. For areas where appropriate for the function, operate spaces using daylight to fully meet the illumination requirement, so that electric light is only needed in non-daylight hours. Fenestration will be compatible with the Installation Design Guide and the ATRP criteria.

---

What are the project goals and requirements for building envelope that will impact energy use?

EAct 2005 and an energy consumption that is at least 40% below the consumption of a baseline building meeting the minimum requirements of ANSI/ASHARE/IESNA Standard 90.1 are required. Special local requirements are indicated in Paragraph 6 of Section 01 10 00.

---

What are the project goals and requirements for building roof that will impact energy use?

Provide roofing systems as indicated in Paragraph 6 of Section 01 10 00 to minimize heat gain. Use high albedo systems. Provide roof insulation systems that meet the energy goals expressed in section 01 10 00 and are continuous with wall insulation systems.

---



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### 3. Indoor Environmental Quality Requirements

What is the intended use for all spaces? For all spaces that have an intended use that is not readily apparent from the space name, provide this information in Table 1.

See Paragraph 5 of Section 01 10 00 and Appendix J Floor Plan. \_\_\_\_\_

What is the anticipated occupancy schedule (numbers of occupants and time frames) for all occupied spaces? Indicate the default occupancy schedule below and for all spaces that have an occupancy schedule that differs from the default, provide this information in Table 1.

0700 – 1730 Monday through Friday.

What accommodations for after-hours use are required? (example: access control, lighting controls, HVAC controls) Indicate general accommodations required below and for all spaces that have special requirements, provide this information in Table 1.

Not required.

What are the lighting, temperature, humidity, air quality, ventilation and filtration requirements for all spaces? Indicate the default requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

Lighting: IESNA Lighting Handbook. Also see Paragraphs 3, 5 & 6 of Section 01 10 00 of the RFP

Temperature: 78 degrees F summer, 68 degrees F winter (conditioned spaces); 10 degrees F above outdoor ambient summer, 55 degrees F winter (unconditioned occupied spaces) \_\_\_\_\_

Humidity: 50% (conditioned spaces); active humidity control is not required \_\_\_\_\_

Air Quality: ASHRAE 62.1 \_\_\_\_\_

Ventilation: ASHRAE 62.1 \_\_\_\_\_

Filtration: ASHRAE 52.1 and 52.2 \_\_\_\_\_

What are the acoustical requirements for all spaces? Indicate the default acoustical requirements below and for all spaces that have a requirement that differs from the default, provide this information in Table 1.

Provide in accordance with the requirements of Section 01 10 00 paragraph 6.

What is the desired level of occupant ability to adjust systems controls? Indicate the default desired levels below and for all spaces that have a desired level that differs from the default, provide this information in Table 1.

Lighting: Per AHSRAE 90.1. Also see Paragraphs 3, 5 & 6 of Section 01 10 00 of the RFP \_\_\_\_

Temperature: 75 degrees F to 78 degrees F summer (conditioned spaces), 68 degrees F to 72 degrees F winter (conditioned spaces), 55 degrees F to 65 degrees F winter (unconditioned occupied spaces)

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Humidity: none \_\_\_\_\_

Air Quality: none \_\_\_\_\_

Ventilation: none \_\_\_\_\_

What, if any, specific types of lighting are desired? (example: fluorescent in 2x2 grid, accent lighting, particular lamps)

See Paragraphs 3, 5 &amp; 6 of Section 01 10 00 of the RFP \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

#### **4. Equipment and System Expectations**

*(Complete for each category as applicable or indicate "none identified" or "N/A". Add desired features information for other anticipated commissioned systems as applicable)*

See Paragraph 6 of Section 01 10 00. Any specific or named equipment and system expectations shall be coordinated with and approved by the Contracting Officer.

\_\_\_\_\_

#### **5. Building Occupant and O&M Personnel Requirements**

How will the facility be operated? Who will operate the facility?

Fort Jackson DPW will operate and maintain the facility. All references to the owner shall be coordinated with and approved by the Contracting Officer.

\_\_\_\_\_

Will the facility be connected to an EMCS? If so, what are the interface requirements? (example: monitoring points, control points, scheduling)

Yes, see Paragraphs 5 and 6 of Section 01 10 00. \_\_\_\_\_

\_\_\_\_\_

What is the desired level of training and orientation for building occupants to understand and use the building systems?

See Paragraph 5 of Section 01 10 00.

\_\_\_\_\_

What is the desired level of training and orientation for O&M staff to understand and maintain the building systems?

See Paragraph 5 of Section 01 10 00.

\_\_\_\_\_

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***Table 1 (not used)***

APPENDIX N  
LEED Requirements for Multiple Contractor Combined Projects

Not Used

APPENDIX O  
LEED Strategy Tables

Not Used

## APPENDIX P

### LEED Registration of Army Projects

15 April 2010

#### **Number of Registrations**

Each building must be registered separately, except multiple instances of a standard building on a shared site may be registered as a single project. If a single registration for multiple buildings is chosen, all buildings under the single registration must earn exactly the same points. Do not register buildings that are exempt from a specific LEED achievement requirement.

#### **Typical Registration Procedure**

1. Login, complete the online registration form (see guidance below) at the GBCI LEED Online website <http://www.gbci.org/DisplayPage.aspx?CMSPageID=174> and submit it online.
2. Pay the registration fee via credit card (USACE staff: credit card PR&C is funded by project design or S&A funds).
3. GBCI will follow up with a final invoice, the LEED-online passwords and template information.
4. The individual who registers the project online is, by default, the Project Administrator.

#### **Completing the Registration Form**

##### **BEFORE YOU BEGIN:**

**Create a personal account with USGBC if you do not have one.**

**You will need the following information:**

**Project name as it appears in P2 (obtain from USACE Project Manager)**

**Building number/physical address of project**

**Zip code for Installation/project location**

**Anticipated construction start and end dates**

**Total gross area all non-exempt buildings in registration**

**Total construction cost all non-exempt buildings only (see Project Details Section instructions below)**

##### **ACCOUNT/LOGIN INFORMATION**

1. The person registering the project **must have an account with USGBC** (login and password) to complete the form. Go to <http://www.gbci.org/>, click on "register a project" at the drop-down menu for project certification (at the top of the page) and select "register now for LEED 2009" to start the project registration process. If you have an account, login with your email address and password and select "register new project" to proceed. If you do not have an account, you may select "register a new account" and follow the instructions. It is recommended that you create an account separately on the USGBC website before you start the form. IMPORTANT: USACE team members are members of USGBC and are eligible for Member prices. USACE team members registering projects should be sure to include the USACE Corporate Access ID in their personal account profile (if you do not have it contact [richard.l.schneider@usace.army.mil](mailto:richard.l.schneider@usace.army.mil) or [judith.f.milton@usace.army.mil](mailto:judith.f.milton@usace.army.mil) for the number).
2. The Account/Login Information section is filled out by the person registering the project. It may be a Contractor or a USACE staff member.

##### **ELIGIBILITY SECTION**

Follow directions (accepting the terms and conditions)

Review your profile information and make corrections if needed

##### **RATING SYSTEM SELECTION SECTION**

Select single project registration and I know which rating system.

Select the rating system - currently only LEED-NC and LEED for Homes are approved for Army use without special approval.

LEED Minimum Program Requirements: select YES

### RATING SYSTEM RESULTS SECTION

Confirm selected rating system.

### PROJECT INFORMATION SECTION

**Project Title:** Begin the project title with a one-word identifier for the Installation. Do not include the word "Fort". After this match the project name used in P2 (contact the USACE Project Manager for this information) and identify the building being registered. Example: "Stewart 4<sup>th</sup> IBC - DFAC".

**Project Address 1 and 2:** This is the physical location of the project. Provide building number, street address, block number or whatever is known to best describe the location of the project on the Installation.

**Project City:** Installation Name

**State, Country, Zip Code:** Self-explanatory

**Anticipated Construction Start and End Dates:** Self-explanatory – give your best guess if unknown. Note that required data entry format is: 1 or 2 digit month/1 or 2 digit date/4 digit year (example 3/23/2010)

**Gross Square Footage:** Provide total area all buildings in LEED project. Exclude the area of any buildings that are exempt from the LEED achievement requirement (for example, exclude an unconditioned storage shed to be constructed with a barracks complex).

**Is Project Confidential:** Indicate NO except, if project has security sensitivity (elements that are FOUO or higher security), indicate YES.

**Notification of Local Chapter:** Indicate NO unless Government/USACE Project Manager requests you to indicate YES.

**Anticipated Project Type:** Select the most appropriate option from the drop-down menu.

**Anticipated Certification Level:** Select the applicable option from the drop-down menu (Silver is the usual level).

### PROJECT OWNER INFORMATION SECTION

**Project Owner First Name, Last Name, email, phone, address:** The Project Owner is the USACE Project Manager. Obtain this info from the USACE Project Manager.

**Organization:** U.S. Army Corps of Engineers. This field MUST be completed this way because it will be used as a search field by higher HQ to find all USACE registered projects. You may supplement it with district name at the end but DO NOT revise or use an acronym.

**May we publish Owner information:** Indicate NO

**Owner Type:** Pick Federal Government from drop-down menu.

**Project Owner Assertion:** Check the box

### PAYMENT INFORMATION

Self-explanatory

**APPENDIX Q**  
**REV 2.1 – 30 SEP 2010**  
**AREA COMPUTATIONS**

**Computation of Areas:** Compute the “gross area” and “net area” of facilities (excluding family housing) in accordance with the following subparagraphs:

**(1) Enclosed Spaces:** The “gross area” is the sum of all floor spaces with an average clear height  $\geq 6'-11"$  (as measured to the underside of the structural system) and having perimeter walls which are  $\geq 4'-11"$ . The area is calculated by measuring to the exterior dimensions of surfaces and walls.

**(2) Half-Scope Spaces:** Areas of the following spaces shall count as one-half scope when calculating “gross area”:

- Balconies
- Porches
- Covered exterior loading platforms or facilities
- **Covered but not enclosed spaces, canopies, training, and assembly areas**
- Covered but not enclosed passageways and walks
- Open stairways (both covered and uncovered)
- Covered ramps
- Interior corridors (Unaccompanied Enlisted Personnel Housing Only)

**(3) Excluded Spaces:** The following spaces shall be excluded from the “gross area” calculation:

- Crawl spaces
- Uncovered exterior loading platforms or facilities
- Exterior insulation applied to existing buildings
- Open courtyards
- Open paved terraces
- Uncovered ramps
- Uncovered stoops
- Utility tunnels and raceways
- Roof overhangs and soffits measuring less than 3'-0" from the exterior face of the building to the fascia

**(4) Net Floor Area:** Where required, “net area” is calculated by measuring the inside clear dimensions from the finish surfaces of walls. If required, overall “assignable net area” is determined by subtracting the following spaces from the “gross area”:

- Basements not suited as office, special mechanical, or storage space
- Elevator shafts and machinery space
- Exterior walls
- Interior partitions
- Mechanical equipment and water supply equipment space
- Permanent corridors and hallways
- Stairs and stair towers
- Janitor closets
- Electrical equipment space
- Electronic/communications equipment space



APPENDIX  
R

RMS INPUT FORM 4288A **Export to RMS in CSV(MS-DOS) (\*.csv) Format** **Note:** Reviewing Office Optional

# APPENDIX

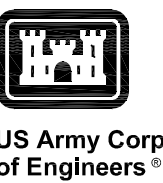
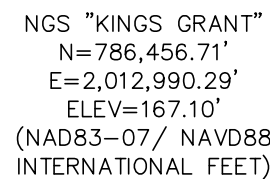
## AA

Topographic Survey

and Existing Utilities Base Maps

Please note: The survey supersedes the base maps. Base maps are provided for information only for areas beyond the bounds of the survey.

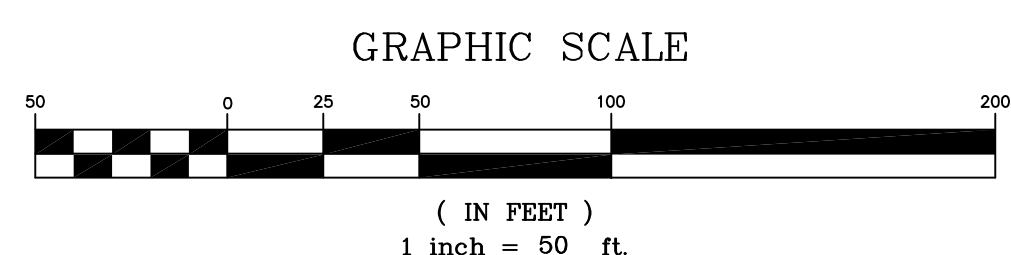
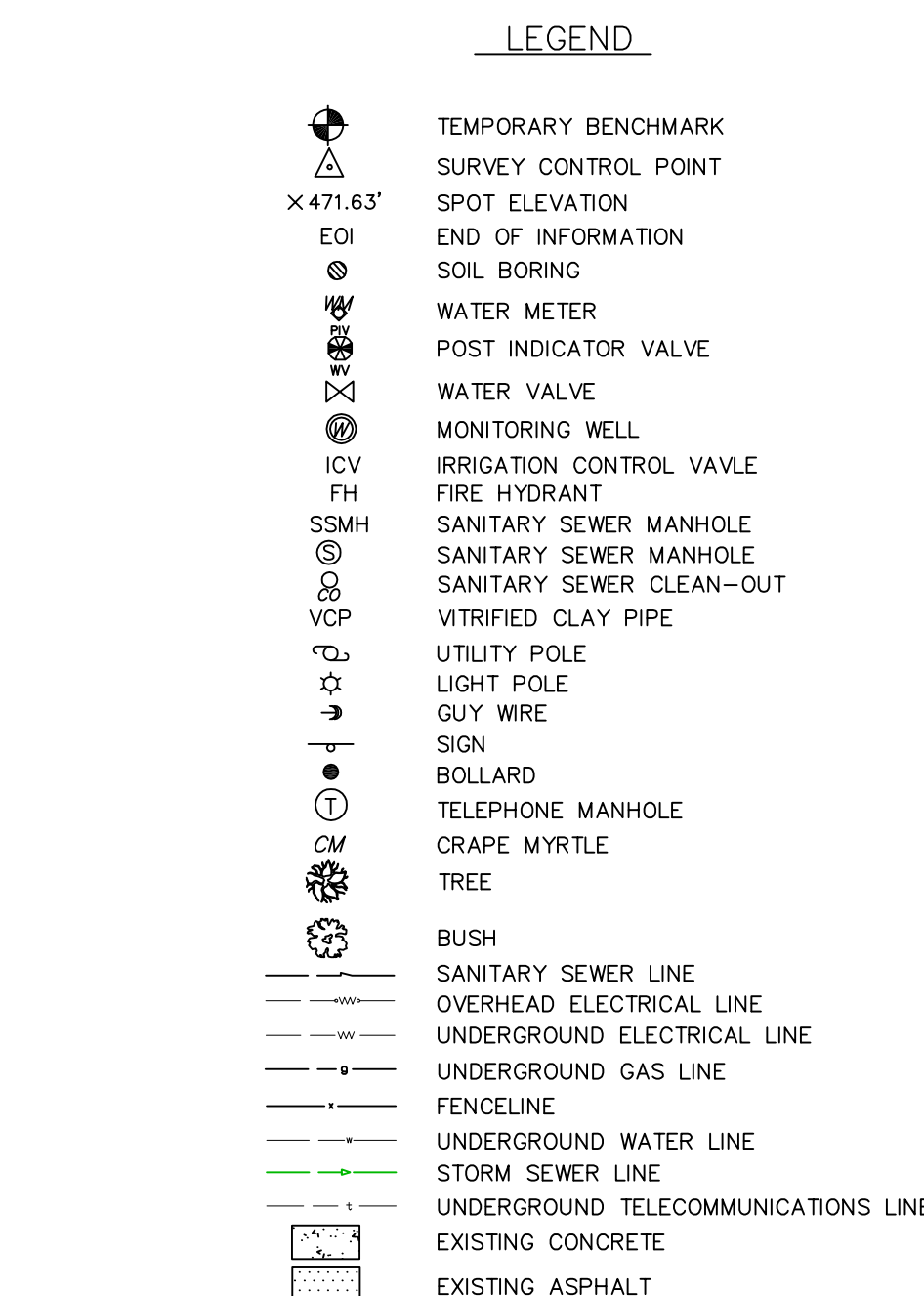
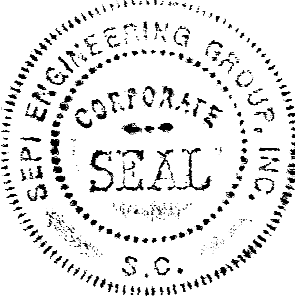
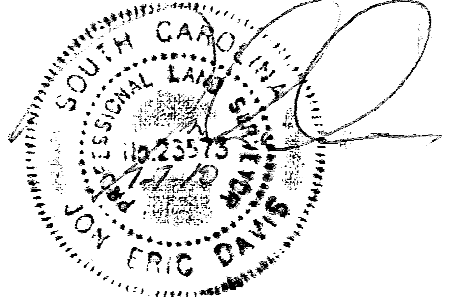


[illegible]

U.S. ARMY CORPS OF ENGINEERS CHARLESTON DISTRICT CHARLESTON, SOUTH CAROLINA	DWN BY: AJP		CKD BY: JED	SOLICITATION NO.: W912HN-95-0-0019
	SUBMITTED BY: [redacted]		FILE NUMBER: 078912910	FILE NAME: Projects\2010ENH10.012-For-Jackson\dwg
SEPI ENGINEERING 1025 WADE AVE RALEIGH, NC 27605	PLOT SCALE: 1" = 50'		PROJECT: 1025 WADE AVE	

TRAINING SUPPORT CENTER  
PORT JACKSON, SOUTH CAROLINA

SHEET  
IDENTIFICATION  
**X-01**  
SHEET 1 OF 1



	<u>SOIL BORING</u>	<u>NORTHING</u>	<u>EASTING</u>	<u>GROUND ELEVATION</u>
TSC-10-1	787265.49	2015862.49	202.08'	
TSC-10-2	787029.24	2015905.87	198.69'	
TSC-10-3	786924.01	2015886.83	197.47'	
TSC-10-4	787071.36	2016145.34	197.25'	
TSC-10-5	786889.43	2016075.26	193.35'	
TSC-10-6	786938.91	2016285.39	193.79'	
TSC-10-7	787004.87	2016414.09	193.48'	
TSC-10-8	786769.77	2016282.99	192.97'	

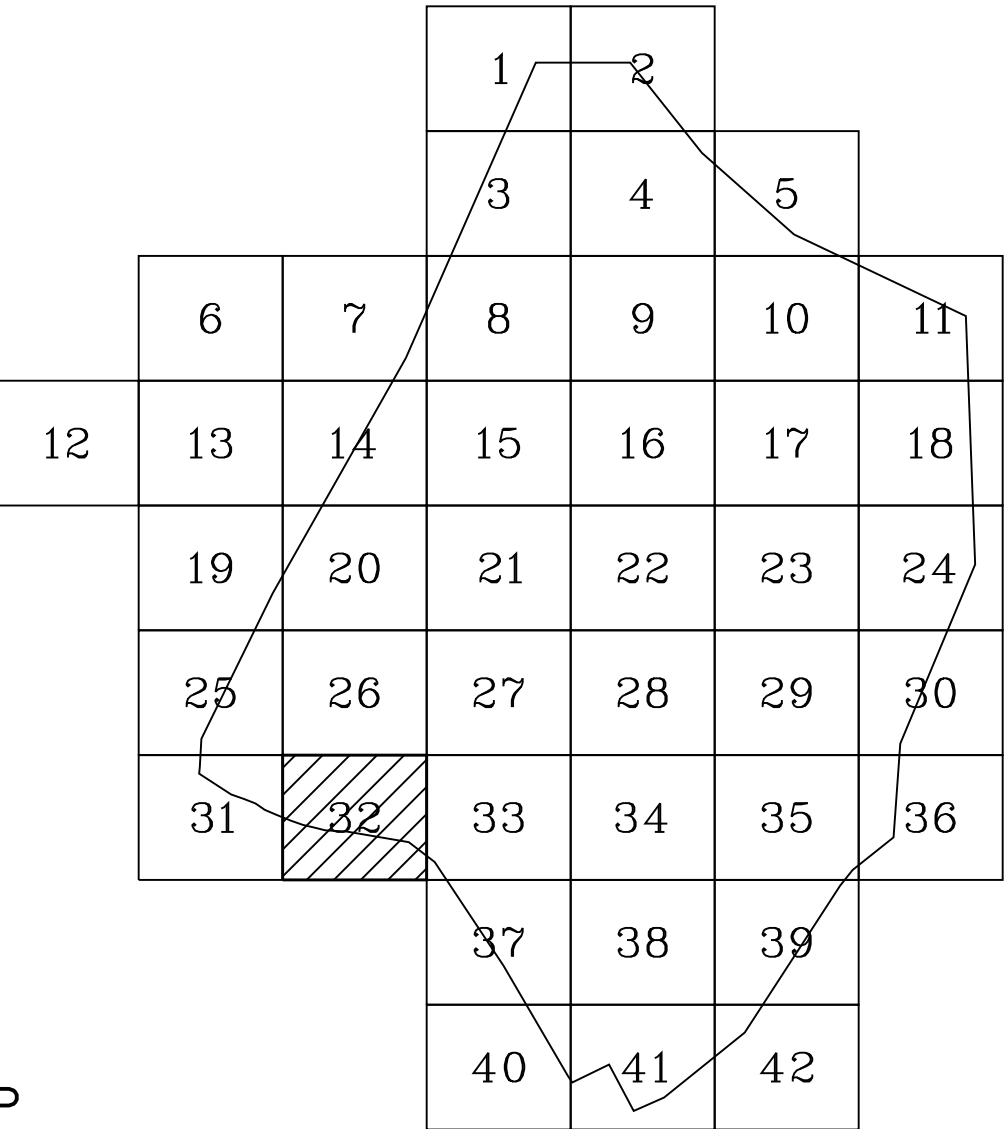
VERTICAL CONTROL: NAVD 88  
HORIZONTAL CONTROL: SOUTH CAROLINA STATE PLANE COORDINATES  
INTERNATIONAL FEET NAD 83-2007

THIS MAP IS A RESULT OF A SURVEY OF AN EXISTING BUILDING OR  
OTHER STRUCTURE SUCH AS A NATURAL FEATURE OR WATERCOURSE.  
THIS IS NOT A BOUNDARY SURVEY, AND IS NOT TO BE RECORDED.

## NOTES

- 1 HORIZONTAL AND VERTICAL CONTROL BASED ON GPS POINTS SET ON  
2 SITE UTILIZING VRS.  
3 ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES UNLESS  
4 OTHERWISE NOTED.  
5 NO BOUNDARY WORK PERFORMED DURING THIS SURVEY.  
6 ALL LOCATIONS OF UNDERGROUND UTILITIES SHOWN HEREON ARE  
7 BASED ON ABOVE GROUND APPURTENANCES, SEE INVESTIGATIONS &  
8 SKETCH BY MCKIM & CREED, AS WELL AS DRAWINGS PROVIDED BY  
9 THE FT. JACKSON ENGINEERING DEPT. FROM UTILITY RECORDS.  
10 LOCATIONS OF UNDERGROUND NON-VISIBLE UTILITIES/STRUCTURES  
11 MAY VARY FROM LOCATIONS SHOWN HEREON. ADDITIONAL BURIED  
12 UTILITIES/ STRUCTURES MAY BE ENCOUNTERED. NO EXCAVATIONS  
13 WERE MADE DURING THE PROCESS OF THIS SURVEY TO LOCATE  
14 BURIED UTILITIES/STRUCTURES..  
15 THIS PLAT IS SUBJECT TO EASEMENTS, AGREEMENTS, OR  
16 RIGHTS-OF-WAY OF RECORD PRIOR TO DATE OF THIS PLAT, WHICH  
17 WAS NOT VISIBLE AT THE TIME OF INSPECTION.  
18 THIS MAP NOT SUBMITTED TO OR APPROVED BY ANY PLANNING  
19 AGENCY.  
20 ALL BEARINGS ARE GRID BEARINGS UNLESS OTHERWISE NOTED.  
21 PRECISION = 1 : 10,000+  
22 PROPERTY LOCATED IS NOT IN A FLOOD ZONE, AS SHOWN ON FIRM  
23 MAP 45079C0177 G, PANEL # 0177, EFFECTIVE JANUARY 19, 1994  
24 EASEMENT NOT KNOWN AT THIS DATE FOR UTILITY LINES, IF  
25 ANY.  
26 COMBINED SCALE FACTOR: 0.999805743  
27 RIGHT-OF-WAYS FOR STREETS NOT KNOWN AT THIS TIME, IF ANY.





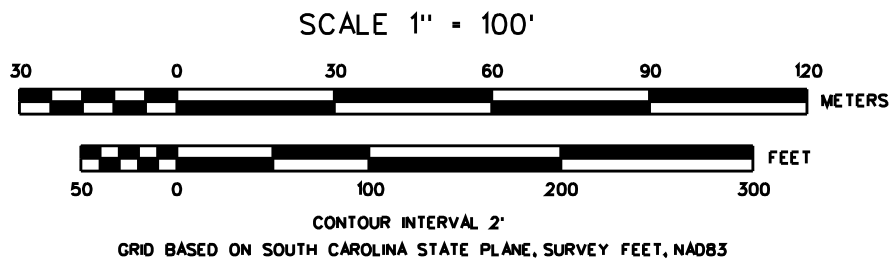
KEY MAP

LEGEND

	EXISTING	PROPOSED
SANITARY MAIN	24 C	
INACTIVE MAIN	24 C	
BUILDING SERVICE	6 C	
INACTIVE BUILDING SERVICE	6 C	
CAP/PLUG MAIN: SERVICE		
VALVE MAIN: SERVICE		
MANHOLE: LIFT STATION		
SEPARATOR: CLEANOUT		
GRIT CHAMBER: EJECTOR		
TREATMENT FACILITY		
SEPTIC TANK		
ABBREVIATIONS:		
PIPE MATERIALS		
TBD TO BE DETERMINED	DI	DUCTILE IRON
AC ASBESTOS CEMENT	GI	GALVANIZED IRON
BR BRICK	GS	GALVANIZED STEEL
C CONCRETE	PVC	POLYVINYLCHLORIDE
CI CAST IRON	RC	REINFORCED CONCRETE
CM CORRUGATED METAL	S	STEEL
CU COPPER	TC	TERRA COTTA
CWS COATED AND WRAPPED STEEL	VC	VITRIFIED CLAY
	WI	WROUGHT IRON

NOTES:

- GENERAL NOTES:
- Map data was compiled from various sources including CADD, GIS, and as-builts. This data is provided for information and planning purposes only.
  - Point data for electric, natural gas, water, and wastewater that were visible were located using HAMMER GPS (sub-meter) devices provided by the US Army Corps of Engineers, ERDC-CERL.
  - Non-visible utility features such as pipes and cables were shifted to match GPS data where appropriate.
  - Planimetric data was shifted to "best fit" 2002 aerial photography provided by the installation.



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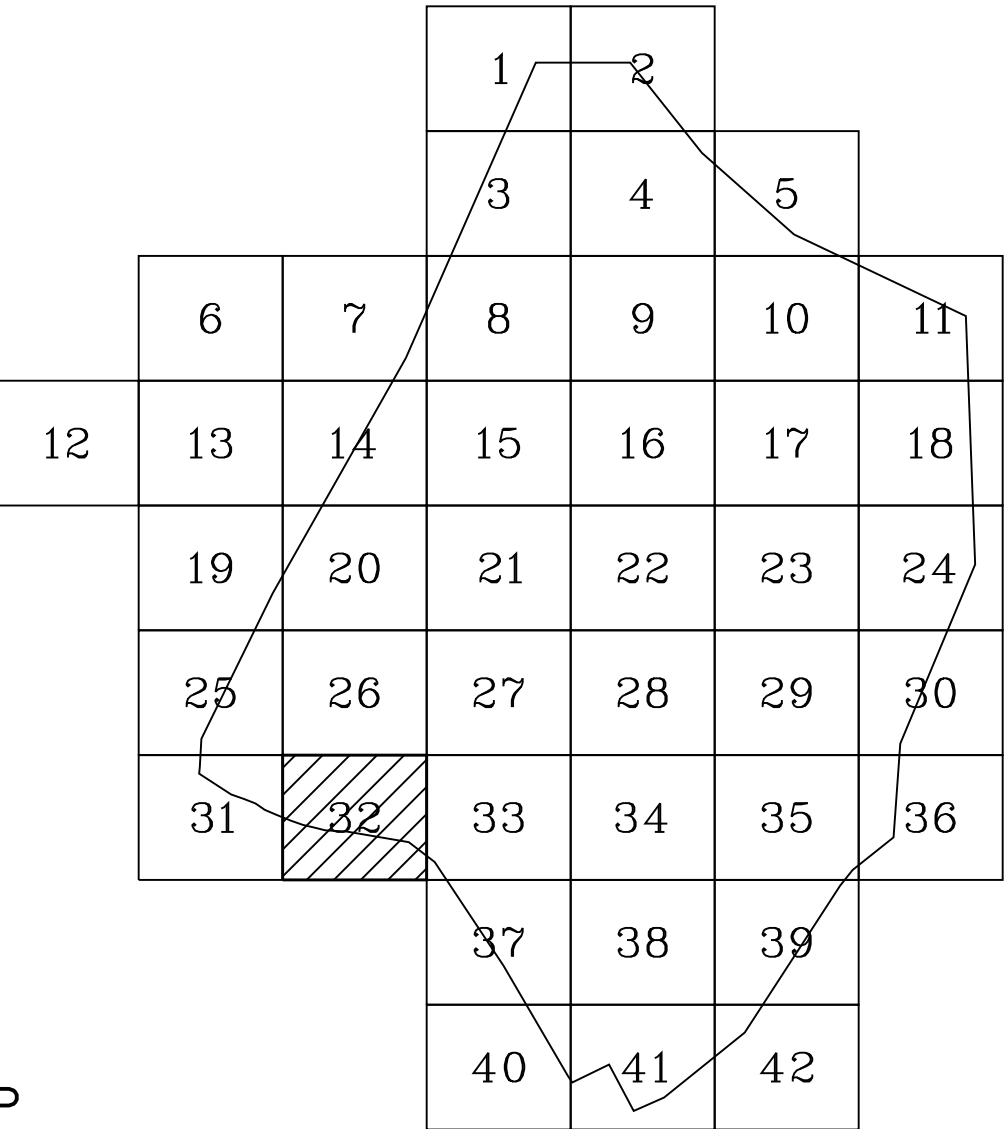
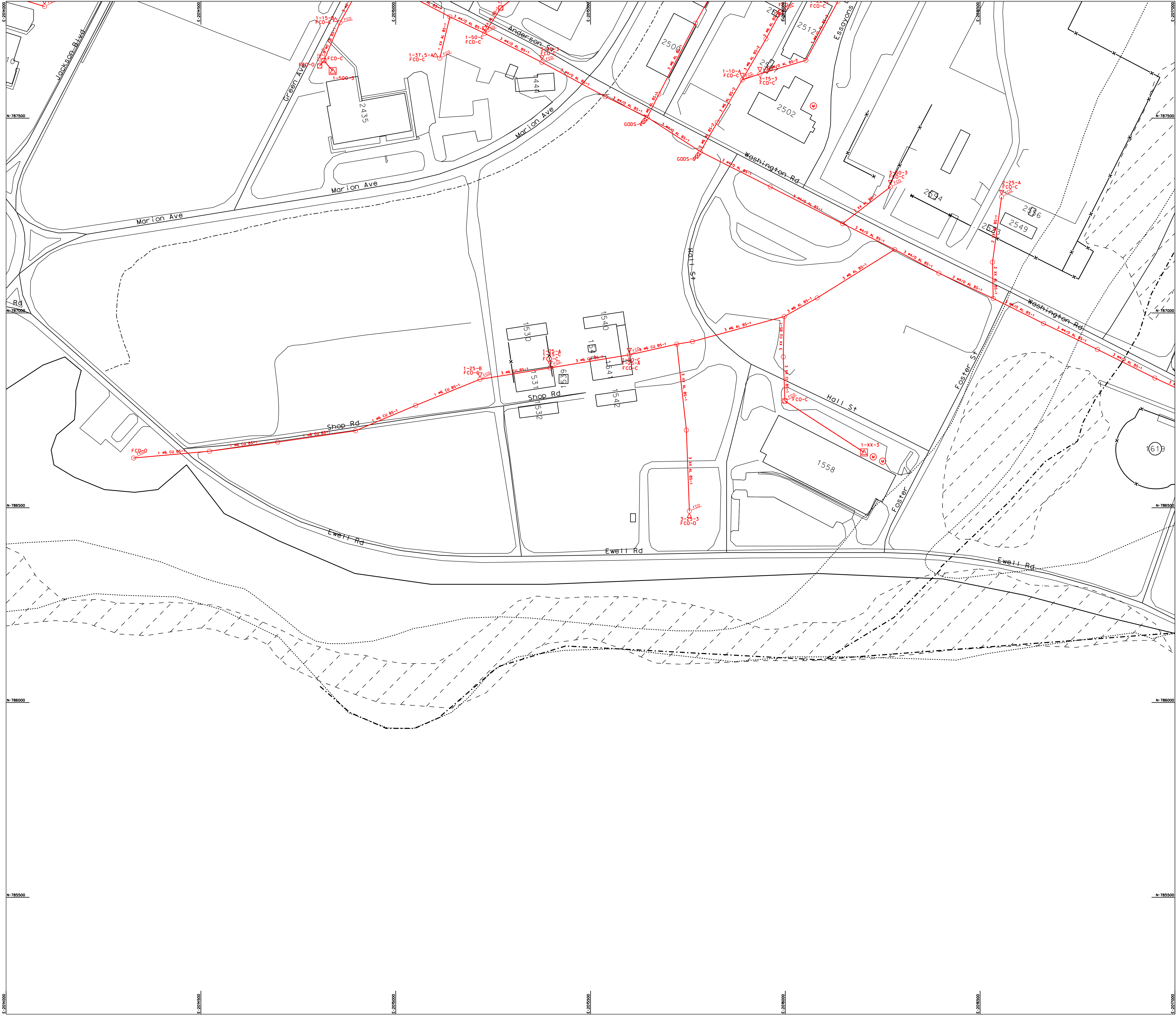
DIRECTORATE OF LOGISTICS AND ENGINEERING  
FORT JACKSON, SC 29207

MASTER PLANNING BRANCH  
BLDG #2562  
CADD CENTER

MASTER PLAN  
WASTEWATER SYSTEM

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL:	DATE 06-28-06	DRAWING NO.
DATE: _____	REVISION NO.	
APPROVED BY MAJOR ARMY COMMAND:	SHEET NO. 32	FILE NO.
DATE: _____		



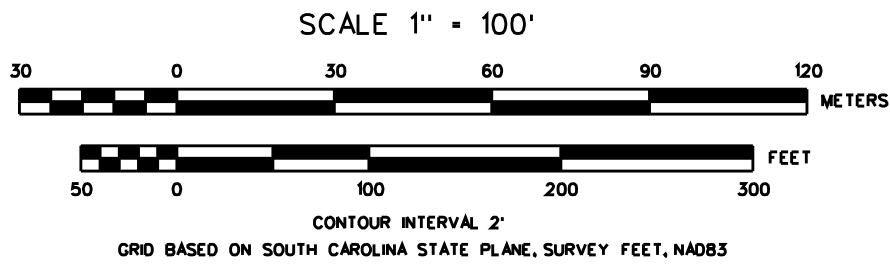


KEY MAP

LEGEND

EXISTING	PROPOSED
NO. AND SIZE OF NEUTRAL NO. AND SIZE OF CONDUCTORS	MATERIAL 3 *4.1*4 ACSR
PRIMARY AERIAL	NO. AND SIZE OF NEUTRAL NO. AND SIZE OF CONDUCTORS
SECONDARY UNDERGROUND	MATERIAL 3 *1/0.1 *1/0 AL UC
DUCT	AW 3 SPARE
MANHOLE: HANDHOLE	CAPACITY, KVA QUANTITY   PHASES 1-50-A
TRANSFORMER POLE MOUNTED	CAPACITY, KVA QUANTITY   PHASES 1-50-3
TRANSFORMER PAD MOUNTED	SWITCH TYPE NORMAL POSITION GDO NO FCO NO
SWITCHES	
CAPACITOR: RISER POLE	
JUNCTION BOX: SPLICE	
METER: VOLTAGE REGULATOR	
EMERGENCY GENERATOR	DB
ABBREVIATIONS:	
SWITCH TYPES AND CONDITION FCO FUSE CUT OUT GDO GANG OPERATED DISCONNECT OS OIL SWITCH REC RECLOSURE	SBD SOLID BLADE DISCONNECT NC NORMALLY CLOSED NO NORMALLY OPEN TBD TO BE DETERMINED
CABLE MATERIAL AAL ANODIZED ALUMINUM ACSR ALUMINUM CABLE STEEL REINFORCED AL ALUMINUM C COPPER	CU COPPER CLAD STEEL PLC PAPER INSULATED LEAD COVERED WP WEATHERPROOF INSULATION TBD TO BE DETERMINED
TYPE INSTALLATION BUR BURIED DB DIRECT BURIED	UC UNDERGROUND TBD TO BE DETERMINED
NOTES:	

GENERAL NOTES:  
1. Map data was compiled from various sources including CADD, GIS, and as-builts. This data is provided for information and planning purposes only.  
2. Point data for electrical, natural gas, water, and wastewater that were visible were located using HAMMER GPS (sub-meter) devices provided by the US Army Corps of Engineers, ERDC-CERL.  
3. Non-visible utility features such as pipes and cables were shifted to match GPS data where appropriate.  
4. Planimetric data was shifted to "best fit" 2002 aerial photography provided by the installation.



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FORT JACKSON, SC 29207

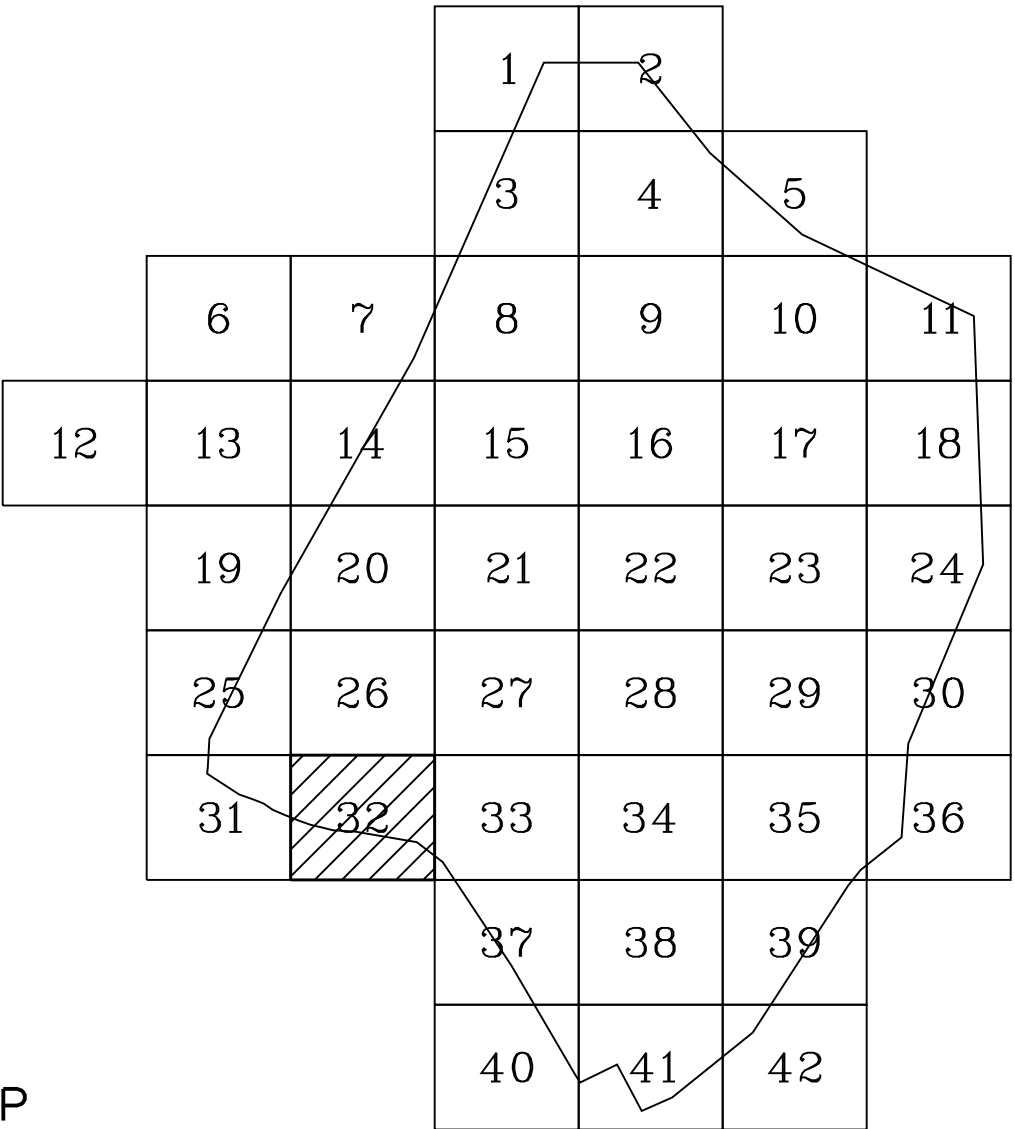
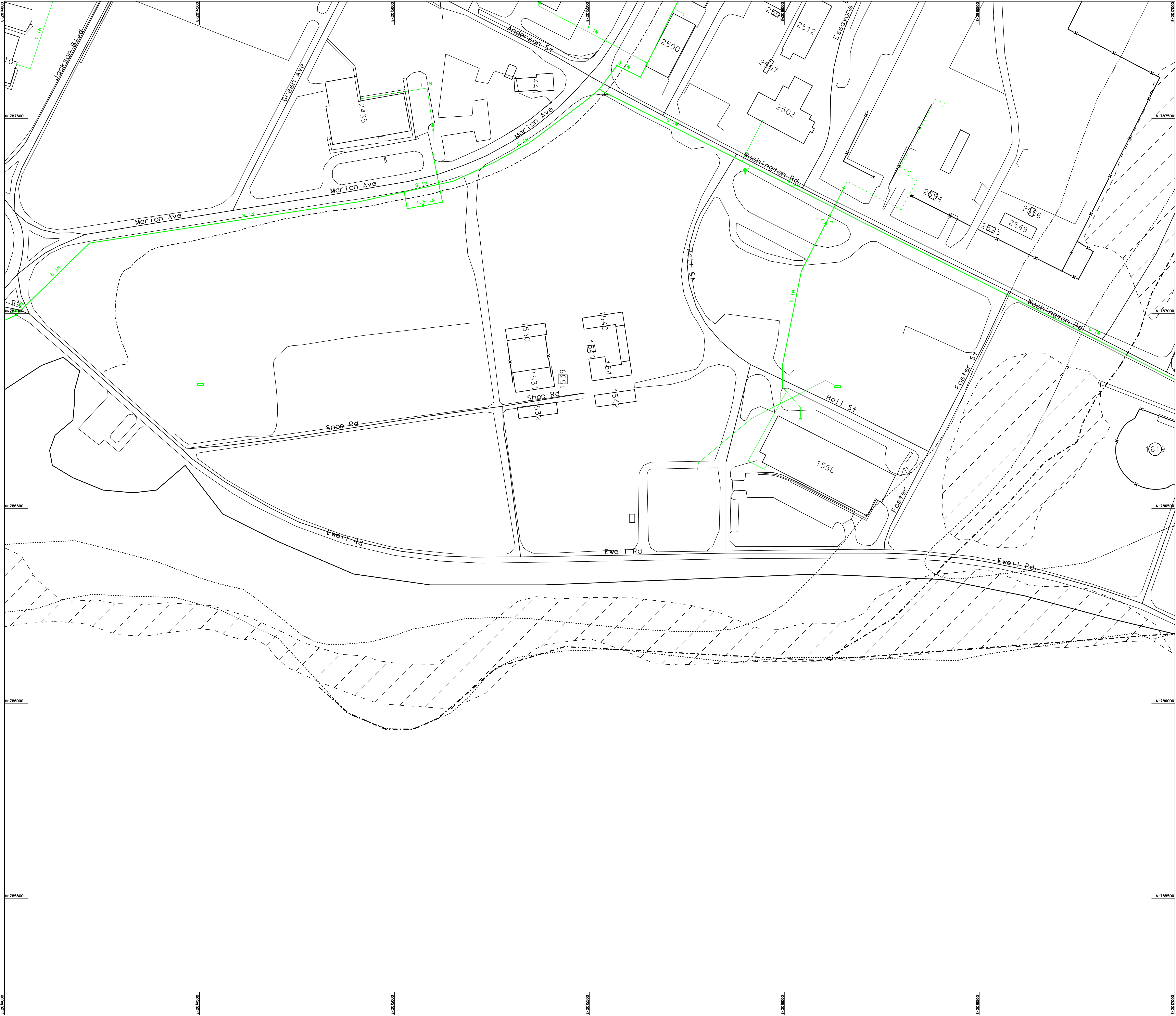
MASTER PLANNING BRANCH  
BLDG #2562  
CADD CENTER

MASTER PLAN

ELECTRICAL SYSTEM

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL: DATE: _____	DATE 06-28-06 REVISION NO. _____ SHEET NO. 32	DRAWING NO. _____ FILE NO. _____
APPROVED BY MAJOR ARMY COMMAND: DATE: _____		





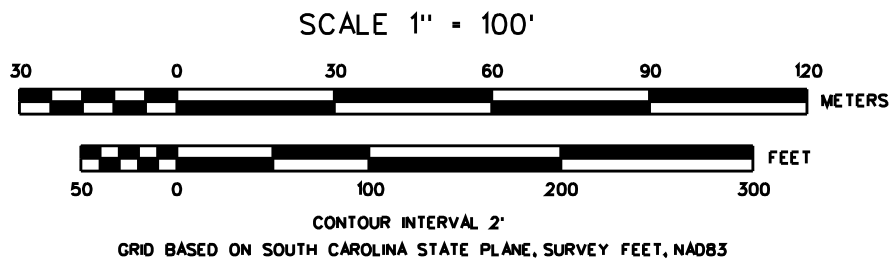
KEY MAP

LEGEND

	EXISTING	PROPOSED
GAS MAIN		
INACTIVE MAIN		
BUILDING SERVICE		
INACTIVE BUILDING SERVICE		
CAP/PLUG MAIN: SERVICE		
VALVE MAIN: SERVICE		
MANHOLE: REGULATOR		
METER: REDUCER		
VENT PIPE: FILL POINT		
REGULATOR IN MANHOLE		
WATER SEPARATOR		
PUMP STATION		
TANK		
ABBREVIATIONS:		
PIPE MATERIALS		
TBD TO BE DETERMINED	GI	GALVANIZED IRON
ABS ACRYLONITRILE BUTADIENE STYRENE	GS	GALVANIZED STEEL
BI BLACK IRON	PE	POLYETHYLENE
CI CAST IRON	PVC	POLYVINYLCHLORIDE
CWS COATED AND WRAPPED STEEL	S	STEEL
DI DUCTILE IRON		
VALVE TYPES		
1 TO BE DETERMINED	5 ANGLE	9 BALL 30 OTHER
2 BUTTERFLY	6 CHECK	10 PLUG
3 GATE	7 STOP	11 PRESSURE RELIEF
4 GLOBE	8 NEEDLE	12 REGULATING

NOTES:

- GENERAL NOTES:
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  - Planimetric data was shifted to "best fit" 2002 aerial photography provided by the installation.



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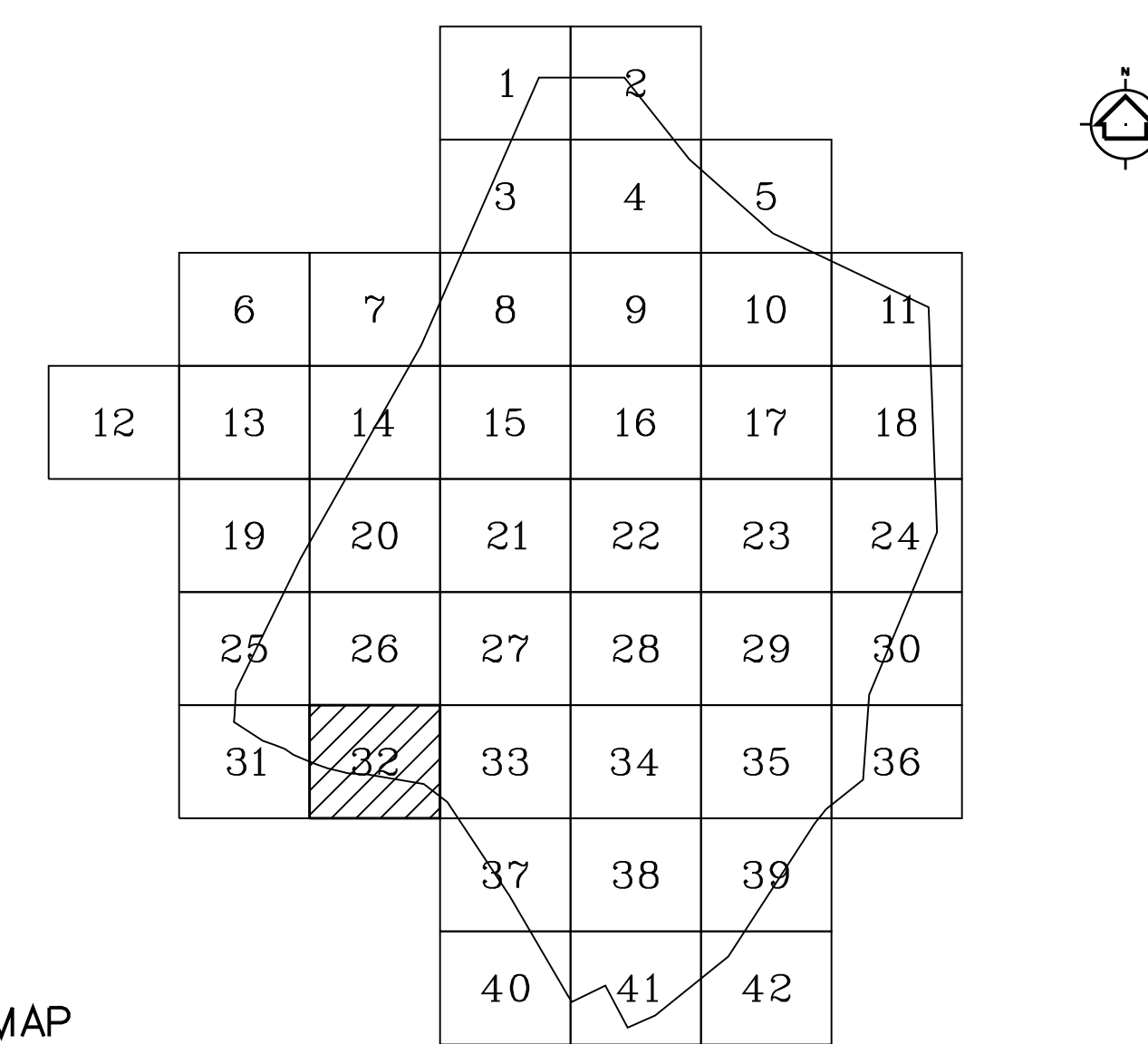
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FORT JACKSON, SC 29207

MASTER PLANNING BRANCH  
BLDG #2562  
CADD CENTER

MASTER PLAN  
NATURAL GAS SYSTEM

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL:	DATE 06-28-06	DRAWING NO.
DATE: _____	REVISION NO.	
APPROVED BY MAJOR ARMY COMMAND:	SHEET NO. 32	FILE NO.
DATE: _____		





### LEGEND

PROPOSED

WATER MAIN

INACTIVE MAIN

BUILDING SERVICE

INACTIVE BUILDING SERVICE

CAP/PLUG MAIN: SERVICE

VALVE MAIN: SERVICE

HYDRANT: METER

POST INDICATOR VALVE: WELL

VALVE PIT: BOOSTER PUMP

AIR VENT: FAUCET

REGULATOR: REDUCER

MANHOLE: FIRE DEPT CONNECTION

WATER TANK

ABBREVIATIONS:

PIPE MATERIALS

TBD TO BE DETERMINED

ABS ACRYLONITRILE BUTADIENE STYRENE

AC ASBESTOS CEMENT

C CONCRETE

CI CAST IRON

CU COPPER

DI DUCTILE IRON

VALVE TYPES

TBD TO BE DETERMINED

2 BUTTERFLY

3 GATE

4 GLOBE

TANK STYLE

AC ABOVE GROUND/NOT ELEVATED

EL ELEVATED

SIZE MATERIAL

1 8 CI

2 CI

2 CI

2 CI

TYPE

M

W

R

STYLE CAPACITY

AG 1 500,000

GI GALVANIZED IRON

GS GALVANIZED STEEL

PVC POLYVINYLCHLORIDE

RC REINFORCED CONCRETE

VC VITRIFIED CLAY

WD WOOD

WI WROUGHT IRON

5 ANGLE

6 CHECK

7 STOP

8 NEEDLE

9 BALL

10 PLUG

11 PRESSURE RELIEF

12 REGULATING

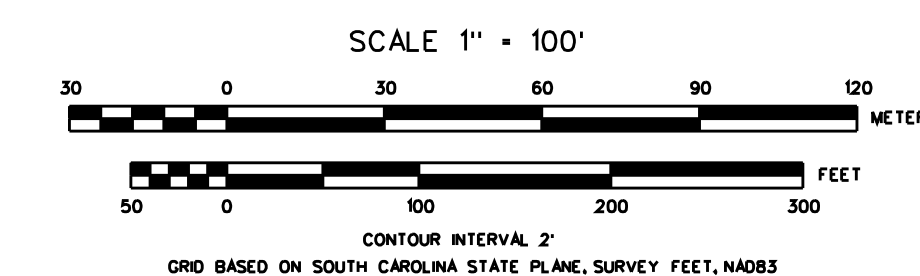
30 OTHER

UG UNDERGROUND

TBD TO BE DETERMINED

GENERAL NOTES:

1. Map data was compiled from various sources including CADO, GIS, and as-builts. This data is provided for information and planning purposes only.
2. Point data for electrical, natural gas, water, and wastewater that were visible were located using HAMMER GPS (sub-meter) devices provided by the US Army Corps of Engineers, ERDC-CERL.
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FORT JACKSON, SC 29207

MASTER PLANNING BRANCH  
BLDG •2562  
CADD CENTER

## MASTER PLAN

## WATER SYSTEM

RECOMMENDED BY THE INSTALLATION PLANNING BOARD FOR APPROVAL:  DATE: _____	DATE 06-28-06	DRAWING NO. _____  FILE NO. _____
	REVISION NO. _____	
	SHEET NO. 37	
APPROVED BY MAJOR ARMY COMMAND:  DATE: _____	_____  _____  _____	

8/24/2006  
Spatial Engineering, Inc., Rincon, GA 31326  
(912) 826-6688





LEGEND

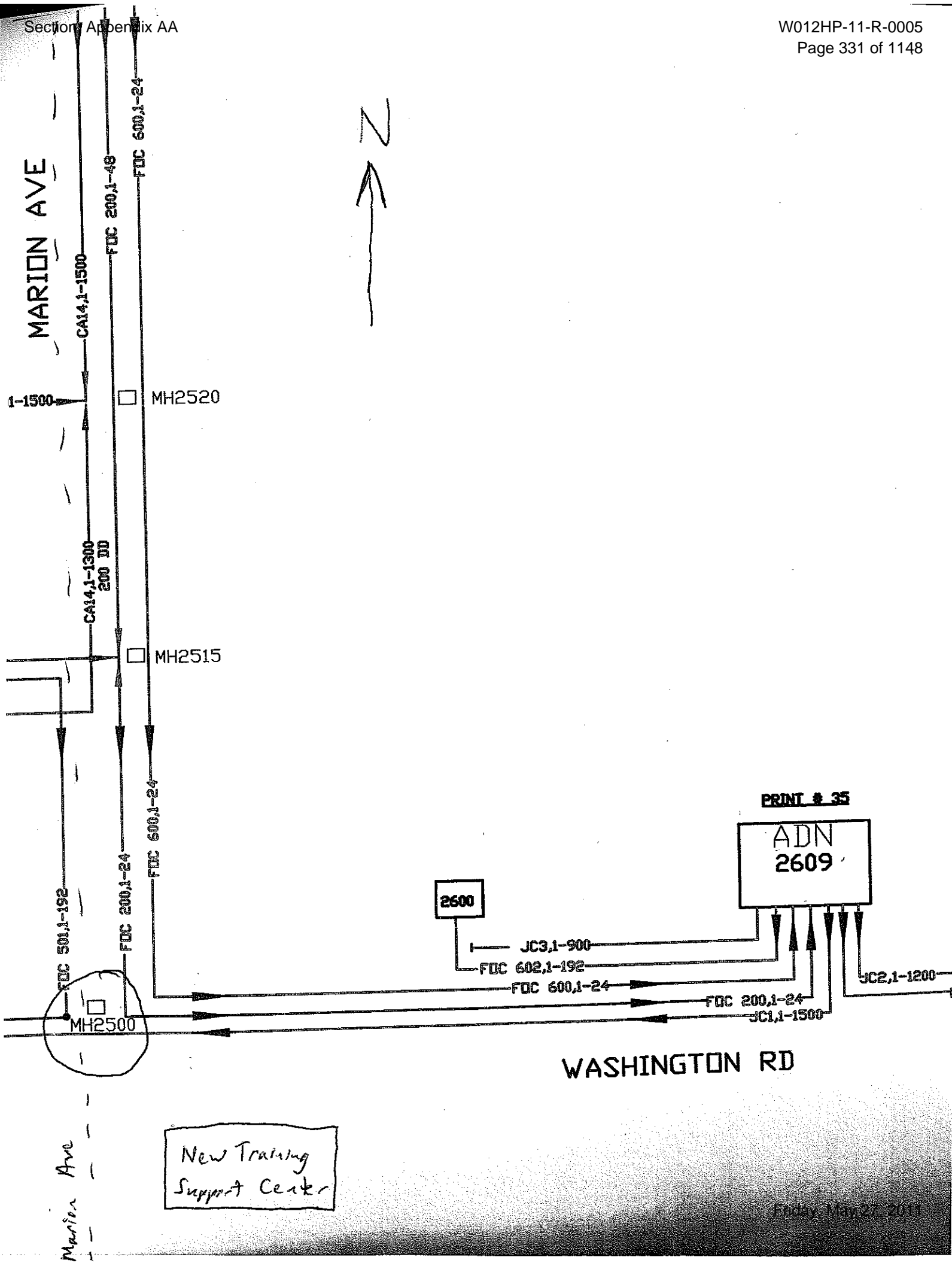
- CHILLED WATER
- MED. TEMP. HOT WATER
- ABANDONED HEATING PIPING

FORT JACKSON  
COLUMBIA, SC

CHILLED WATER  
AND  
MEDIUM TEMPERATURE HOT WATER  
CENTRAL ENERGY PLANT #3  
BUILDING 1699

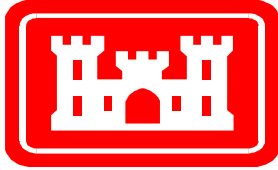
9 MAY 2011

SCALE: 1" = 10'



# APPENDIX

## BB



**U.S. Army**  
**Corps of Engineers**  
Huntsville Center

Installation Support Center of Expertise (ISCX)

# **Training Support Center (TSC)**

**Army Criteria Tracking System**  
**Standard Information**  
**Category Code 14129**  
**November 2007**

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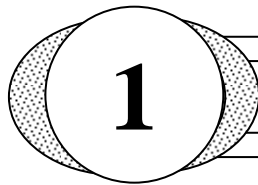
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**CHAPTER 2 – DESCRIPTION & INTERNAL FUNCTIONS..... 3**

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**CHAPTER 4 – DESCRIPTION & EXTERIOR SUPPORT CRITERIA. .... 13**

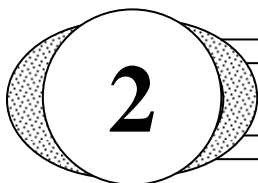
**CHAPTER 5 – LAND USE CRITERIA. .... 14**



## CATEGORY CODE DATA

### Chapter 1 – Category Code Data.

- 1.1 Category Code 141.29, Training Support Center (TSC)
- 1.2 Area UM = SF
- 1.3 Other UM = PN
- 1.4 Program UM = SF
- 1.5 Type = B – Building
- 1.6 Glac = 1730 – Building
- 1.7 Proponent = DCS Army G3
- 1.8 IC = 01 –Aviation & Operation Facilities
- 1.9 FCC = 141 –Operations Buildings
- 1.10 FCG = 14129 – Training Support Center
  - 1.10.1. FAC = 1732 – Training Aides Center
- 1.11 ISR Facility Class = 1100 – Operations and Training
- 1.12 ISR Category = 1120 – Training Instruction Facilities
- 1.13 ISR Subcategory = 1123 –Training/Training Support Facilities
- 1.14 DA Pam 415-28 (*Category Code*) A building that is used to fabricate, maintain, store, and issue training devices including Multiple Integrated Laser Engagement System (MILES); it also provides the administrative space for the training support division management staff.

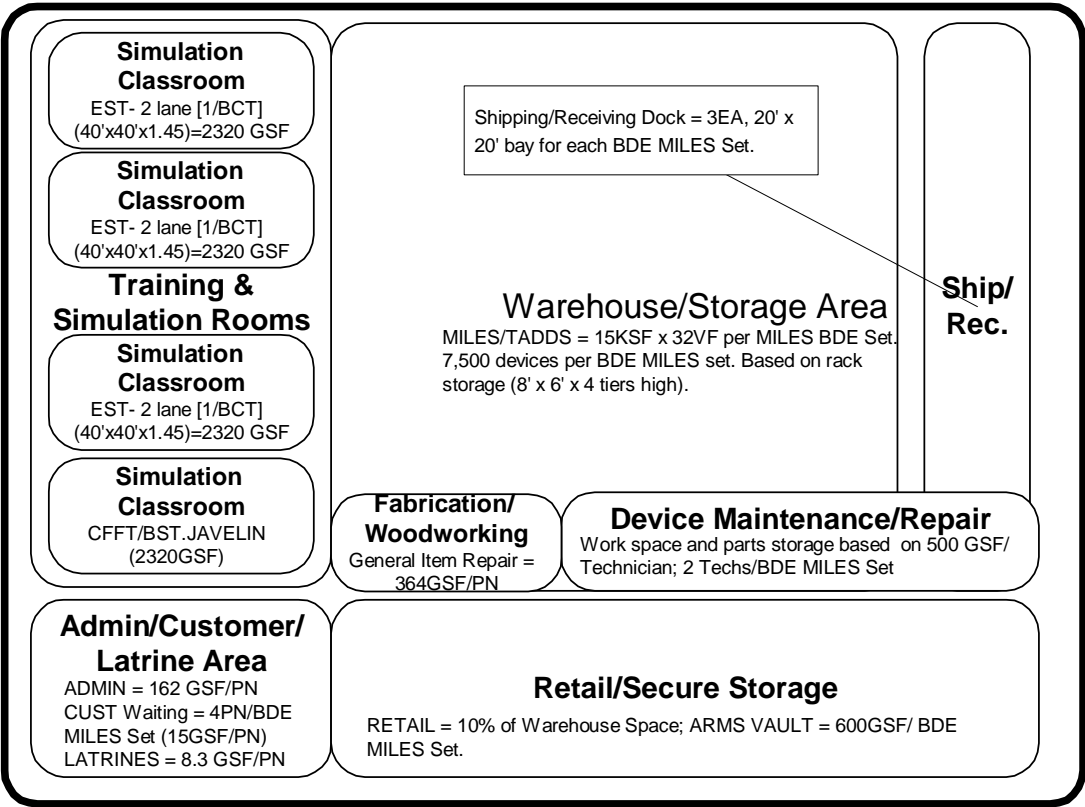


## DESCRIPTION & INTERNAL FUNCTIONS

### Chapter 2 – Description & Internal Functions.

**2.1 DESCRIPTION.** DA PAM 415-28: A building that is used to fabricate, maintain, store, and issue training devices including Multiple Integrated Laser Engagement System (MILES); it also provides the administrative space for the training support division management staff. Common training device used to establish requirement for facility is the authorized Brigade Sets of MILES equipment. The average of 5,000 components associated with a standard Brigade MILES Set is used to size Training Support Real Property as defined herein.

**2.2 INTERNAL FUNCTIONAL ELEMENTS.** A facility that includes primarily warehouse space for storage, issue and maintenance of training devices and components. The facility may include: warehousing space, shipping/receiving areas, device fabrication (woodworking and plastics), general item repair, general purpose administrative space, sensitive item storage (arms vaults) multi purpose classrooms/work centers, break areas, and latrines. This is a general purpose facility intended for use by installation Directorate of Plans and Training (DPT). Figure 2.2 demonstrates functional relationships of notional design space.



Training Support Center  
Notional Design.  
February 2006

Figure 2.2

**2.1 INPUTS.** Number of Government and Contractor support personnel found in the TDA paragraphs and contract documents; number of authorized Brigade MILES Sets.

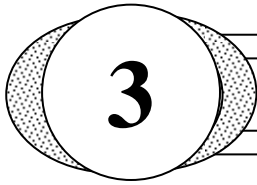
**2.1.1. Training Support Center.**

**2.1.1.1. TDA STAFF:** The full time staff required to support Training Support Center device sustainment; store, issue, receive, account, maintain and fabricate training devices; and support all training events. This category includes contractor support and government management. Based on validated staffing metrics.

**2.1.1.2. CONTRACTOR STAFF:** Total number of contractors authorized to work in a TSC environment.

**2.1.1.3. APPROVED BRIGADE MILES SETS:** ACOM approved distribution for Brigade MILES Sets is the baseline for real property sizing. Each Brigade Set provides space for storage, issue, turn-in, maintenance, repair, and prepare for issue and turn-in and general support space. Other training devices are factored as a component of a BCT MILES Set in determining space requirements/allowances.





## BASIC CRITERIA

### Chapter 3 – Basic Criteria.

**3.1** The US Army Standard Design Criteria, Army Criteria Tracking System for: General Purpose Administration, category code 61050; General and Multi Purpose Classrooms, category code 17119 & 17120; Latrines, Janitor Closets from ACTS for Category Codes 17119; and General Item Repair from ACTS for category code 21414. General Supply and Storage Category Code 44220 requirement derived from physical measurement of standard Brigade Combat Team (BCT) MILES Set, average of 5,000 components, container stored, issued and accounted for, vertical (cubic) storage and associated material handling equipment (MHE) factored. Retail space derived as a percentage (10%) of General Warehouse/Storage Category Code 44220 requirement. 10% factor derived from physical measurement of related and support components for standard BCT MILES Set and other training devices. Secure Storage (Arms Vault) derived based on large size standard weapons storage vault for each BCT MILES set authorized. Physical measurement of component storage was used to determine sizing for sensitive item storage. Device Maintenance & Repair derived by physical measurement of space associated with MILES and related training device maintenance and repair. Shipping/Receiving space derived from physical measurement of BCT MILES Set requirements for staging, issue and condition inspection device turn-in activities. Fabrication/Woodworking derived from Category Code 21414 for gross space allocation for each assigned TDA staff plus 200 gross square feet for general supplies storage and device staging. Simulation Classrooms derived from Army criteria and from physical space requirements from the simulation device material fielding plans.

### 3.2 STANDARD DESIGN CRITERIA.

#### 3.2.1 TRAINING SPACE, CLASSROOM.

**3.2.1.1.** General instruction rooms are space that includes primarily classroom space for multipurpose training instruction. These general purpose rooms are intended for use by organizations which serve a large population for classroom and device simulation instruction. These rooms are distinct from organizational classroom areas (F17119) associated with battalion headquarters and trainee barracks. The primary method used for sizing classrooms is the Engagement Skills Trainer (EST) simulation device. Two 20 x 40 foot lanes per Brigade Combat Team (total is 40' x 40' plus 45% for circulation) equals  $(1600 \text{ GSF} \times 1.45) = 2,320 \text{ GSF}$  for each classroom.

Figure 3.2.1.1		
# BCT Sets	EST Allowance	Gross Area (SF)
1	2,320	2,320
2	2,320	4,640
3	2,320	6,960
4	2,320	9,280

#### 3.3.1 ADMINISTRATIVE SPACES.

**3.3.1.1. Customer Waiting Area.** Customers factored based on 4 personnel for each Brigade Combat Team (BCT) MILES Set authorized. A factor of 15 GSF per customer used to calculate this space allowance. Figure 3.3.1.1 shows allowance:

Figure 3.3.1.1		
#BCT Sets	Customers	Gross Area (SF)
1	4	60
2	8	120
3	12	180
4	16	240

**3.3.1.2. Administration Offices.** Space for building operations, budget, scheduling, technical support, contracting officer representative, program and training administration. A factor of 162 GSF per staff member used to calculate this space allowance Figure 3.3.1.2 shows allowance for each facility size.

Figure 3.3.1.2		
Size of TSC	Staff	Gross Area (SF)
Small	1-12	162-1944
Medium	13-22	2106-3564
Large	23-30	3726-4860

**3.3.1.3. Device Maintenance and Repair Area.** Device set-up, storage, maintenance and repair. Provides work bench, storage, tools storage and repair parts storage areas. Contract maintenance assumes 2 technicians for each Brigade MILES Set. Actual number of contract personnel must be used to factor actual requirement. A factor of 500 GSF per repair person used to calculate this space allowance Figure 3.3.1.3 shows allowance for each facility size.

Figure 3.3.1.3		
#BCT Sets	# of Repair PN	Gross Area (SF)
1	2	1,000
2	4	2,000
3	6	3,000
4	8	4,000

### 3.4.1 WAREHOUSING AND STORAGE.

**3.4.1.1. Shipping/Receiving Loading Dock.** A loading dock is important for new stand-alone facilities. It should be remote from the customer entrance and collocated with supply/storage area. A 20' x 20' bay size for staging MILES containers and other training devices is needed to support issue and turn-in functions. Three (3) bays are required for each Brigade MILES Set authorized.. Figure 3.4.1.1 shows allowance for each facility size.

Figure 3.4.1.1		
#BCT Sets	# of Bays	Gross Area (SF)
1	3	1,200
2	6	2,400
3	9	3,600
4	12	4,800

**3.4.1.2. Device Fabrication (woodworking/plastics).** Training aids are fabricated using woodworking tools, bench fabrication, tools used are saws, drills, sanders, routers. Plastics fabrication uses injection molding, roto molding, and other similar tools and setups. Installations with an Armywide fabrication mission require space for plastics manufacturing. Figure 3.4.1.2 shows allowance for each facility size where “A” designates a TSC with an Armywide fabrication mission and “L” is for TSCs with local fabrication only.

Figure 3.4.1.2		
Armywide mission/ Local	# of FABR PN	Gross Area (SF)
A	6-10	3000-5000
L	1-5	500-2500

**3.4.1.3. Warehouse/Storage Area.** General Purpose Warehouse requirement based on physical measurement of standard BCT MILES Set, average of 5,000 components, containerized and stored on racks four tiers high. Floor space for 4-tier racks and material handling equipment access/circulation plus other training device storage equates to 15,000 GSF/BDE Set. Figure 3.4.1.3 shows allowance for each facility size.

Figure 3.4.1.3		
#BCT Sets	MILES Set Allowance	Gross Area (SF)
1	15000	15000
2	15000	30000
3	15000	45000
4	15000	60000

### 3.5.1 SPECIAL FUNCTIONAL USE AREAS.

**3.5.1.1. Latrines.** Male and female latrines with standard fixtures. Allowance is derived from ACTS and is 8.3 GSF/PN. Figure 3.5.1.1 shows allowance:

<b>Figure 3.5.1.1</b>		
<b>Size of TSC</b>	<b>Staff</b>	<b>Gross Area (SF)</b>
Small	1-12	8.3-99.6
Medium	13-22	107.9-182.6
Large	23-30	190.9-249

**3.5.1.2. Student/Staff Break Areas.** Refrigerator, sink, microwave, vending, phones, television. Lounge type furniture w/ tables and with seating for personnel. Break Room/lounge allowance is 8.7 GSF/PN. Figure 3.5.1.2 shows allowance for each facility size.

<b>Figure 3.5.1.2</b>		
<b>Size of TSC</b>	<b>Staff</b>	<b>Gross Area (SF)</b>
Small	1-12	8.7-104.4
Medium	13-22	113.1-191.4
Large	23-30	200.1-261

**3.5.1.3. Secure Operations Storage.** Secure storage area for sensitive devices and other sensitive communication and automation components. Allowance derived using measured area and is based on standard size large weapons storage vault at 600GSF/BCT MILES Set. Figure 3.5.1.3 shows allowance for each facility size.

<b>Figure 3.5.1.3</b>		
<b>#BCT Sets</b>	<b>Allowance Each BCT MILES Set</b>	<b>Net Area (SF)</b>
1	600	600
2	600	1200
3	600	1800
4	600	2400

**3.5.1.4. Retail Device Storage.** Retail space derived as a percentage (10%) of General Warehouse/Storage Category Code 44220 requirement. 10% factor derived from physical measurement of related and support components for standard BCT MILES Set and all other Training Aide devices. Figure 3.5.1.4 shows allowances for each facility size.

<b>Figure 3.5.1.4</b>		
<b>#BCT Sets</b>	<b>Warehouse Allowance</b>	<b>10% of Warehouse Gross Area (SF)</b>
1	15000	1500
2	30000	3000
3	45000	4500
4	60000	6000

**3.5.1.5 Hazardous Material Storage Area:** Hazardous materials used by the training support center include, but not limited to, propane, polyurethane, and oxygen. Storage area will be in compliance with existing government safety regulations. This storage area will not be included in the square footage of the training support center facility, but requirements for space will be annotated on the 1391. A separate facility will be required for this storage area and this facility can be acquired through the Government Services Administration (GSA) retail catalog using OMA funding.

### **3.6.1 SUPPORT SPACES.**

**3.6.1.1. Janitor Closet.** Provide one at each toilet. Allowance is based on 0.3 GSF per building occupant, from ACTS for CC17119. Figure 3.6.1.1 shows allowances:

<b>Figure 3.6.1.1</b>		
<b>Size of TSC</b>	<b>Staff</b>	<b>Gross Area (SF)</b>
Small	1-12	0.3-3.6
Medium	13-22	3.9-6.6
Large	23-30	6.9-9

**3.6.1.2. Mechanical/Electrical Space.** Provide dedicated interior spaces and exterior areas for plumbing, fire protection, and HVAC equipment. Allowances based on industry averages as

follows: Buildings less than 50,000 GSF use 7% of gross space; less than 100,000 GSF use 5% of gross space; greater than 100,000 GSF use 3% of gross space. Figure 3.6.1.2 shows allowance for each facility size.

<b>Figure 3.6.1.2</b>			
<b>Size of TSC</b>	<b>Factor</b>	<b>Average Gross Area (SF)</b>	<b>Average Mechanical Space (GSF)</b>
Small	7%	26,000	1,820
Medium	5%	70,500	3,525
Large	3%	121,000	3,630

**3.7.1 Gross Area Factor.** Used to convert net areas to gross 1.45.

**3.8.1 OCONUS Exceptions, None.**

**3.9.1 PRIMARY FACILITY TOTALS.**

<b>Figure 3.9.1</b>	
<b>Size of TSC</b>	<b>Average Gross Area (SF)</b>
S	27,820
M	74,025
L	124,630

# **DESCRIPTION AND EXTERIOR SUPPORT CRITERIA**

## **Chapter 4 – Description & Exterior Support Criteria.**

- 4.1 TRAINING SUPPORT CENTER (TSC)** is an emerging training support environment. Current exterior training support features and functional space will continue to change. The current criteria are derived from actual field investigations and surveys from how units are training in 2006 and obtaining training devices to support that training.
- 4.2** Primary functional areas are: Issue/receiving of devices with primary emphasis on MILES equipment; device fabrication mission; POV and Tactical vehicle parking associated with on-site simulation and device training.
- 4.3** Telecommunications provide access to post voice and data systems. Interior telecommunications provided voice and data services, wireless (as needed) and primary facility intercom system connectivity.





# 5

## LAND USE CRITERIA

### Chapter 5 – Land Use Criteria.

#### 5.1 PLANNING CONSIDERATIONS – Troop Housing/Command & Control

**Land Use or Heavy to Light Industrial.** Priority for land use is associated with moderate acreage requirements to support the full range of Training Support Center (TSC) functions. Each facility and support area must factor as a minimum 100% land area for future expansion. TSC is a training magnet of functional space and provides increasing opportunity for simulation and virtual training. Troop Housing/ Command & Control land use is first priority based on proximity to troop densities to support TSC needs. Second order priority would be for light industrial land use based on potential for large acreage tracts availability. Preferred land use is to establish a new category titled 'Training Campus Land Use' situated in close proximity to troop housing and light industrial land use areas. Direct access for troops is the priority for proximity. Consideration must be made for tactical vehicle access.

**5.2 LAND REQUIREMENTS.** Components of land requirements are: primary facility; site egress and ingress; utility access; Installation Design Guide standards; POV parking; Tactical vehicle parking; and, force protection stand-off distances. Future expansion needs should factor a minimum 100% expansion of each functional component. Figure 5.2 established site selection quantity ranges for each TSC size:

**Figure 5.2**

Size of TSC	Bldg (SF)	60% Occupant POV (35SY/VH)	6 VEH BCT.Set Tactical (35SY/VH)	CirculationF actor @ 15% (SY)	Gross Area (AC)
S	27,820	12 (420)	6 (210)	95	725
M	74,025	22 (770)	12 (420)	179	1369
L	124,630	30 (1050)	18 (630)	1150	2830

**5.3. AFFINITIES.** Training Support Centers should be located in close proximity to other training facilities: classroom and simulations. Integration of tactical vehicles for daily parking to access simulation systems evokes proximity needs for existing tactical vehicle maintenance facilities.

**5.4 INFRASTRUCTURE.** Utilities requirements must consider water for fire protection and potable needs; waste water treatment, electrical power, 3-phase; primary heating commodity for geographic area; and most importantly, voice and data connectivity to the post wide infrastructure.

# APPENDIX

## CC

List of Equipment in Existing Training Support Center *					
Area	Item Description	Power required?	Nameplate Data	Approximate Dimensions	Remarks
Woodworking Shop	12” disk sander	Yes	1HP, 115/230V, 1Ø, 13.6/6.8A		
"	Small band saw	Yes	115/230V, 1Ø, 9.2/4.6A, ½HP		
"	Large drill press	Yes	Nameplate was not found.		
"	Small drill press (Delta)	Yes	115/230V, 1Ø, 10/5A, ¾HP		
"	Small drill press (Rockwell)	Yes	115/230V, 1Ø, 10.4/5.2A, ¾HP		
"	Large band saw	Yes	230/440V, 3Ø, 3HP, 9.2/4.6A		
"	Jig saw	Yes	115V, 1Ø, 8.5A, ½HP		
"	4” x 14” belt sander w/10” disk sander	Yes	Nameplate was not found.		
"	6” x 18” belt sander	Yes	30A disconnect, 3Ø		
"	6” jointer	Yes	115V		
"	8” jointer	Yes	220V, 3Ø		
"	20” planer	Yes	115/230V, 1Ø, 30.6/15.3A, 3HP		
"	24” planer	Yes	230V, 3Ø, 18.0A		
"	10” radial arm saw (Dewalt)	Yes	120V, 12.5A, 2 ½HP		
"	10” radial arm saw (Delta)	Yes	120/240V, 1Ø, 13.0/6.5A, 1 ½HP		
"	16” radial arm saw	Yes	220/240V, 3Ø, 14/7A, 5HP		
"	10” table saw	Yes	230V, 1Ø, 12.4A		
"	16” table saw	Yes	230V, 3Ø, 30A, 10HP		
"	10” chop saw (portable, 2 each)	Yes	115V		
"	Table router	Yes	230V, 3Ø, 8A		
"	6” swing wood lathe	Yes	120V		
	(6 items below are metal working machinery located in wood shop)				
"	National Sheet Metal Shear	Yes	30A Disconnect, 3Ø		
"	Bench grinder (2 each)	Yes	115V, 1HP		
"	Belt sander	Yes	115/230V, 1Ø, 7.0/3.5A, ½Hp		
"	5” swing metal lathe (South Bend)	Yes	Nameplate was not found.		
"	Sheet metal break	No			
"	Grommet press	No			
"					
Area Adjacent to Paint Shop	Drill press (Buffalo)	Yes	115/230V, 1Ø, 9.8/6.9A, 3/4HP		
"	Drill press (Delta Rockwell)	Yes	115/230V, 1Ø, 11.2/5.6A, 3/4HP		
	Sandblasting cabinet	Yes	115V		Exhaust tied into woodworking exhaust system. Provide independent exhaust system in new facility.
	Power hack saw (metal cutting band saw)	Yes	208/230/460V, 3Ø, 6.8/6.4/3.2A		
	Large band saw (for wood)	Yes	220/440V, 3Ø, 8/4A, 3HP		
	Sheet metal break (3 foot)	No			
Machine Shop	Scotchman “Ironworker” (combination punch/shear/etc.)	No		6' x 7'	
"	Sheet metal break (8 foot)	No		4' x 12'	
"	Power hack saw	Yes	115V	5' x 2'	
"	Manual hydraulic press	Yes	460V, 3Ø, 14.8A, 10HP	5' x 3'	
"	Large band saw (metal cutting)	Yes	240V, 30A	4' x 6'	
"	Bridgeport end mill	Yes	208/460V, 3Ø, 6.5/3.1A, 2HP	8' x 6'	
"	Belt sander (metal)	Yes	115V, 7A, 1.5HP	3' x 4'	

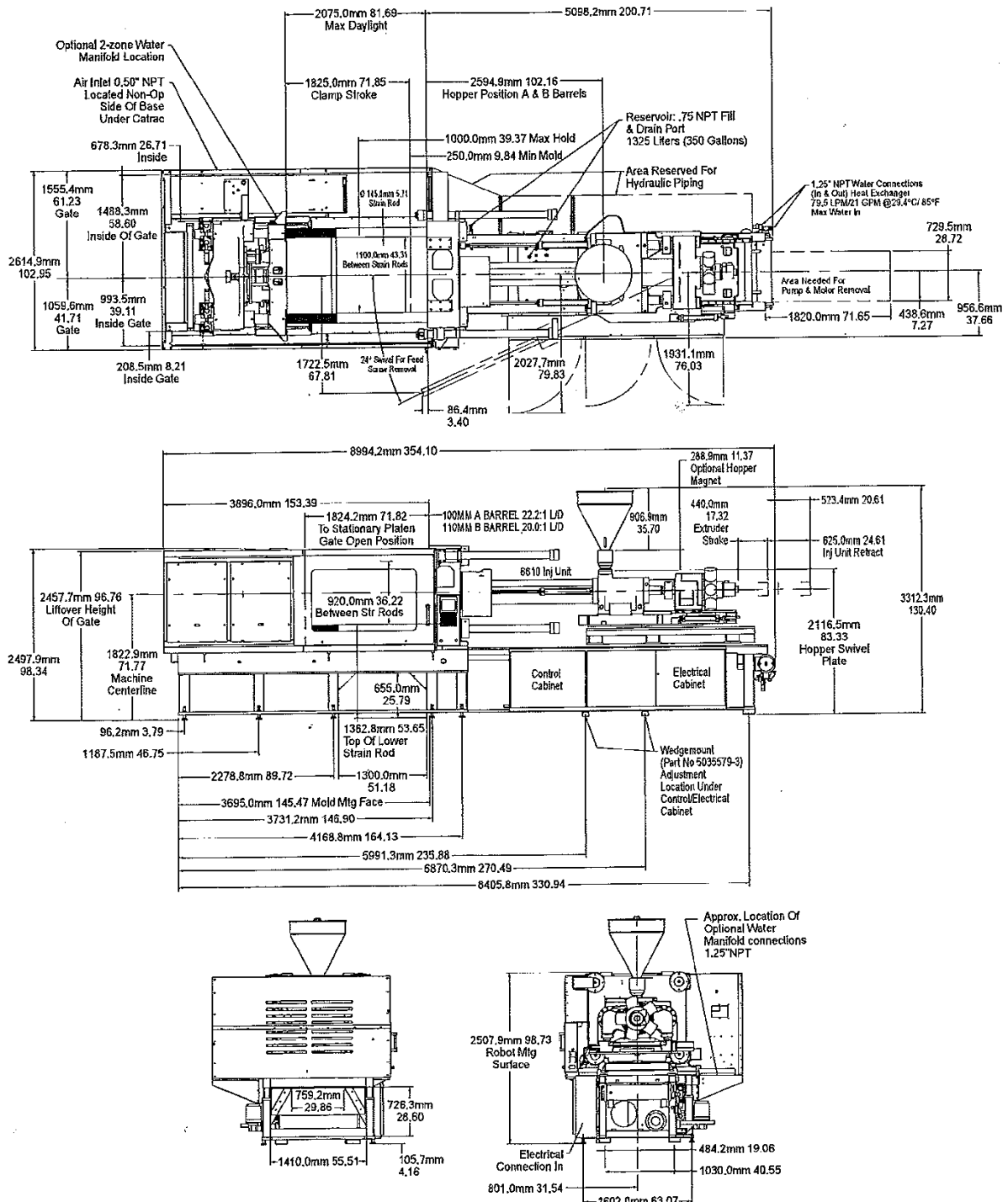
"	CNC mill (Millitronics model RH30)	Yes	220V, 3Ø, 50A	12' x 16'	
"	CNC mill (Millitronics model MB30)	Yes	220V, 3Ø, 30A	12' x16'	
"	CNC lathe (Bridgeport)	Yes	240V, 3Ø, full load 50A	12' x 6'	
"	Surface grinder (Harig by Bridgeport)	Yes	208V	6' x 4'	
"	14” swing metal lathe (South Bend)	Yes	230V, 3Ø, 30A disconnect	4' x 8'	
"	Drill Press	Yes	115V	3' x 2'	
Welding	Arc Welder	Yes	200/230/460V, 1Ø, 110/96/48A, 18kW		
Urethane Molding Shop	Drill press	Yes	?		
"	Pedestal grinder	Yes	?		
Injection Molding Shop	Cincinatti Milacron MM 580 Injection Molding Machine	Yes	See cutsheet enclosures	9' x 36'	
"	Cincinatti Milacron MT170 Injection Molding Machine	Yes	See cutsheet enclosures	7' x 34'	
"	Cincinatti Milacron VT-440-54 Injection Molding Machine	Yes	See cutsheet enclosures	6' x 18'	
"	Portable water-to-water chiller (Milacron model MCW-40W-41HRX)	Yes	460V, 3Ø, 80FLA	3' x 8'	Currently uses total-loss cooling from potable water system. Provide cooling tower for chillers at new facility. This chiller has sufficient capacity to cool all three IM machines.
"	Portable water-to-water chiller (Budzor model BWA-W0-03-CCB-12-0-000)	Yes	230V, 3Ø, (5HP, 21.4A compressor), (1HP 2.5A pump)	3' x 5'	Currently uses total-loss cooling from potable water system. Provide cooling tower for chillers at new facility.
"	Portable water-to-water chiller (Application Engineering Corp)	Yes	Nameplate was not found.	3' x 5'	Currently uses total-loss cooling from potable water system. Provide cooling tower for chillers at new facility. No other data found-machine out of service at time of survey but will be repaired ASAP.
"	Plastic Pellet Dryer	Yes	460V, 3Ø, 55.7A, 15KW Heater	5' x 12'	
"	Plastic Pellet Dryer	Yes	460V, 3Ø, 30A Heater - 115V, 1Ø Motor	3' x 2'	
Paint Shop	10' W x 8' H x 6' D open front paint booth				
"	Exhaust blower (est. 36” diameter vane axial blower)	Yes	Nameplate was not found.		

\* Note- list is provided for information only; verify actual equipment during facility design.



# MAXIMA 580 WP

## MACHINE DIAGRAM



# ***MAXIMA MM 580 WP***

## **CLAMP UNIT SPECIFICATIONS**

	English		Metric	
Clamp Force	tons	580	kN	5150
Clamp Opening Force	tons	29	kN	257
Clamp Stroke	in.	71.9	mm	1825
Clamp Speed Open	in./sec.	41	mm/sec.	1041
Clamp Speed Close	in./sec.	39	mm/sec.	991
Maximum Daylight	in.	81.7	mm	2075
Min/Max Mold Thickness	in.	9.8 / 39.4	mm	250 / 1000
Maximum Mold Weight	lbs.	22,100	kgs	10025
Platen Size ( H x V )	in.	56.3 x 49.2	mm	1430 x 1250
Distance Between Tie Rods ( H x V )	in.	43.3 x 36.2	mm	1100 x 920
Tie Rod Diameter	in.	5.71	mm	145
Ejector Stroke (Max)	in.	7.9	mm	200
Ejector Force @2000 psi	tons	13.2	kN	117

## **MACHINE SPECIFICATIONS**

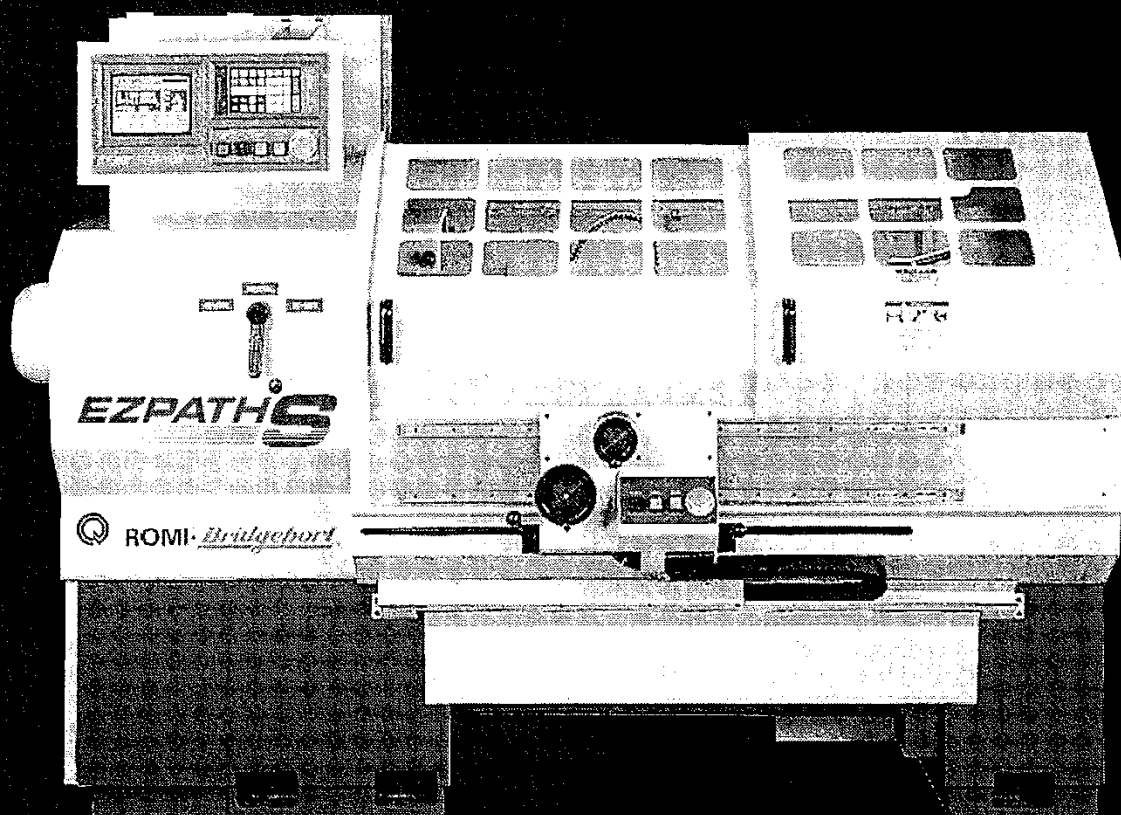
	English		Metric	
Overall Length (w/ 3470 IU)	in.	354.1	mm	8994
Overall Width	in.	103.0	mm	2615
Overall Height	in.	129.0	mm	3278
Shipping Weight (without oil)	lbs.	57,250	kg	26020
Hydraulic System Pressure	psi	2,950	bar	203
Variable Volume Pump Capacity	gpm	60	L/min	227
Fixed Pump Capacity	gpm	72	L/min	273
Injection and Extruder	gpm	111	L/min	420
Eject and Core Pull	gpm	21	L/min	79
Electric Motor	hp	100	kw	75
Total Oil Reservoir Capacity	gal	260	L	984
Heat Exchanger Water @85° F	gpm	21	L/min	79



Due to continuous improvements, specifications are subject to change without notice.  
3/5/2007

# EZPATH-S

## Operations and Programming Manual



## TRANSPORTATION

When transporting or lifting the machine take special care to avoid collision between its components and between the machine and other equipment.

Any collision may cause damage to parts and components as well as misalignment of its precision components.

Instructions for safe lifting and transportation of the machine are described below and they should be strictly followed to avoid damage to the machine and injuring people.

### TRANSPORTATION INSTRUCTIONS

Before moving and lifting the machine, the following instructions should be followed.

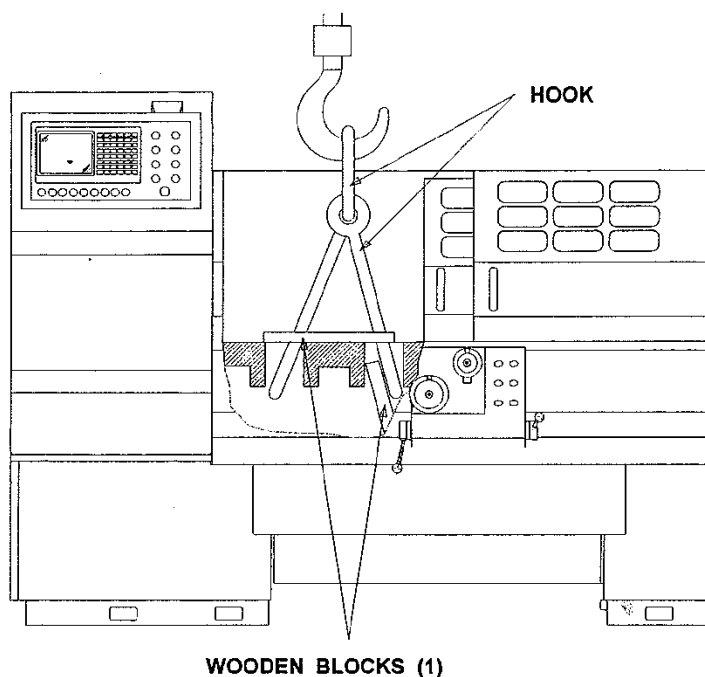
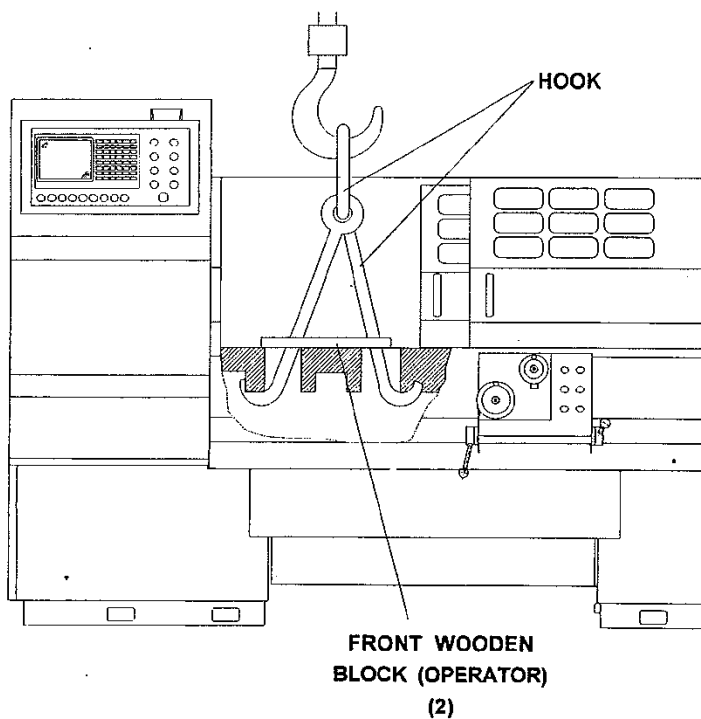
- 1 - Clamp the saddle/cross carriage and tailstock at the bed right side.
- 2 - Close and lock front sliding splash guard, electrical panel door and control panel to avoid any movement during lifting and transportation.
- 3 - Put the wooden blocks as shown below. This will avoid damage to the bed.
- 4 - Before transporting the machine be sure the machine is balanced and carefully avoid collisions.

After following the above instructions, lifting and transportation are as shown below.

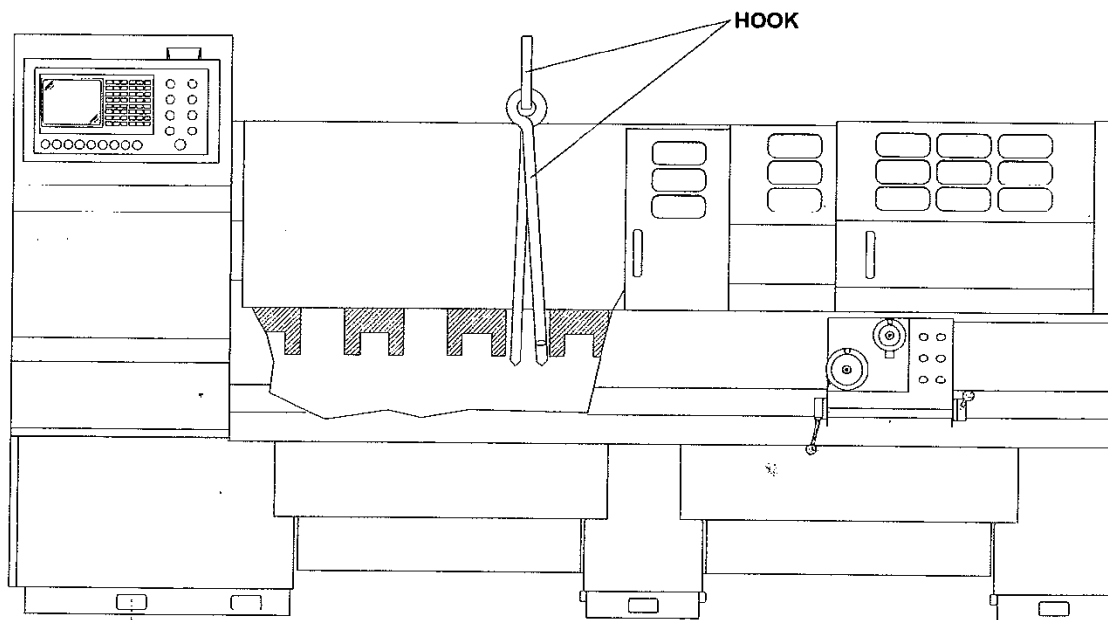
#### Approximate net weight

EZPATH IIS x 1,0m => 5,625 lbs (2,550Kg)  
EZPATH IIS x 1,5m => 6,175 lbs (2,800Kg)  
EZPATH IIS x 2,0m => 7,190 lbs (3,260Kg)

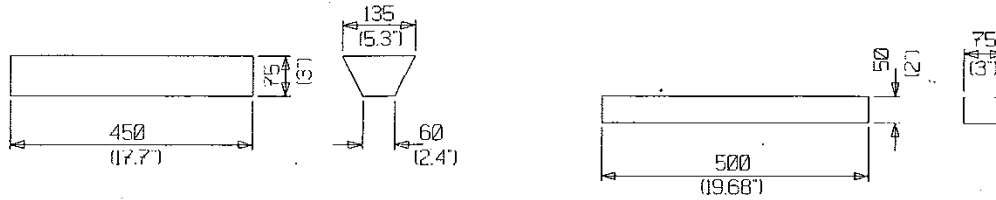


**EZ-PATH II SD X 1,000MM (40")****EZ-PATH II SD X 1,500MM (60")**

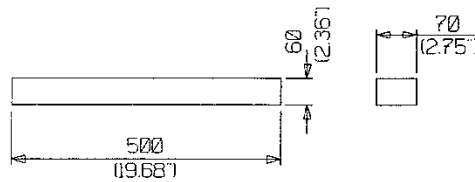
**EZ-PATH II SD X 2,000MM (80")**



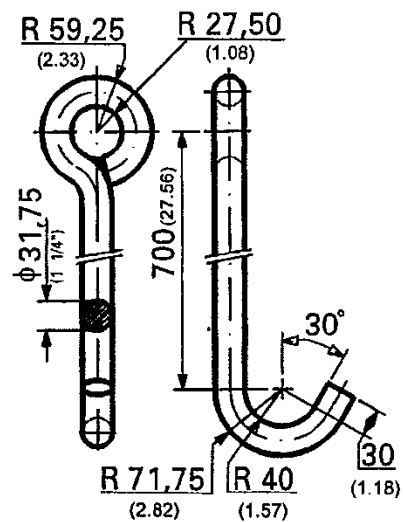
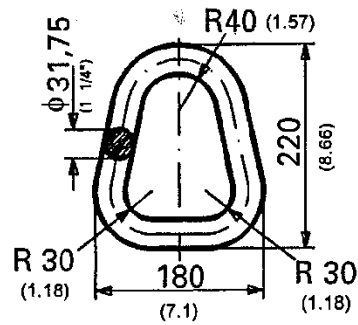
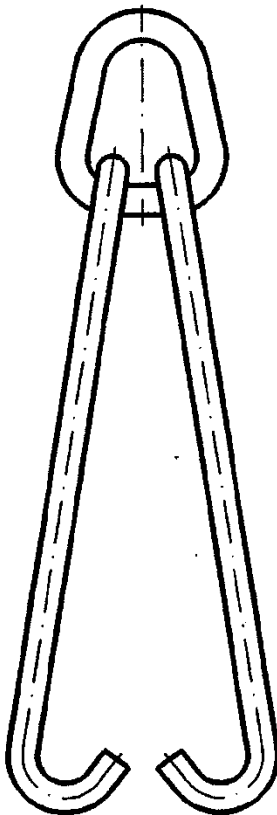
### WOODEN BLOCKS (1)



### WOODEN BLOCKS (2)



### HOOK ASSEMBLY



**DIMENSIONS IN MM (INCH)**

## ELECTRICAL INSTALLATION

If electrical power is not sufficient for the machine, serious and unexpected malfunction problems may occur, it may result in dangerous operation and cause a reduction in the electrical components useful life. Therefore, it is very important to take all the necessary care and make sure that the machine is connected to a suitable power source and that it operates under the same conditions of the plant power.

### INPUT POWER

**(See machine layout)**

Prepare an individual branch circuit for each CNC machine. Conductors and branch circuit protection elements should be selected in accordance to the table 1 below.

TABLE 1  
Machine Electrical Data

TRANSFORMER T1 CONNECTIONS		
TERMINAL	VOLTAGE	AMPS
208V	208V	69
230V	230V	63
380V	380V	38
460V	460V	31
480V	480V	30

When connecting the incoming power this is done through the main connector (CB-1) which is connected to the T1 transformer.

The T1 transformer must be connected (and must be verified right before energizing the machine for the first time) according to the table 1. Always observe the maximum variation allowed for the incoming power ranges between +/- 10% of the normal voltage.

The nominal power of the machine is directly proportional to the nominal voltage of the incoming power. The power available on the machine was calculated related to the nominal incoming power.

INPUT POWER				
POWER KVA	VOLTAGE	CURRENT	CB-1 adj.	WIRE GAGE
25	208V	72	0.90	5/16
	230V	64	0.80	5/16
	380V	38	0.95	5/16
	400V	38	0.95	5/16
	420V	38	0.95	5/16
	460V	34	0.85	5/16

For 200/250 VAC use a 32/40AMP DISCONNECT (CB-1)

For 360/480 VAC use a 20/25AMP DISCONNECT (CB-1)

Cable size is determined in accordance with cable admissible current.

Once it is defined the length of the branch circuit cable that will supply power to the machine, the power supply shall also be defined in accordance with power variations.

## GROUNDING

Prepare exclusive grounding for CNC machines with resistance lower than or equal to five (5) ohms, rated according to installed power. If there is more than one CNC machine, the same grounding can be used provided that independent grounding conductors are used for the connection.

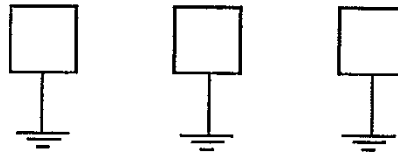
Grounding should be as close as possible to the machine.

To determine protection conductor minimum size, use table II.

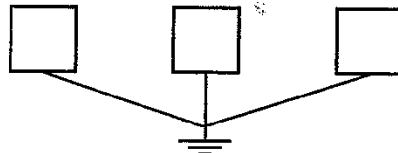
When connecting the grounding wire make sure to connect it to the proper ground lug. The ground lug is located inside of the electrical cabinet.

Connecting this wire to any other part of the machine body reduces the performance of grounding and may result in personal injury.

Independent Grounding (correct) ---->

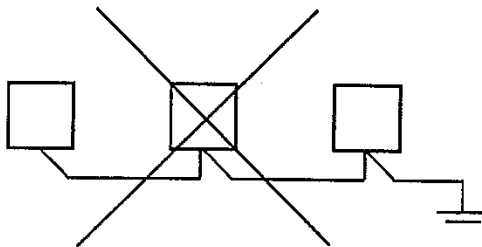


Parallel Grounding (correct) ---->



### CAUTION ! :

Grounding in Series  
( *Never make this type !* ) ---->

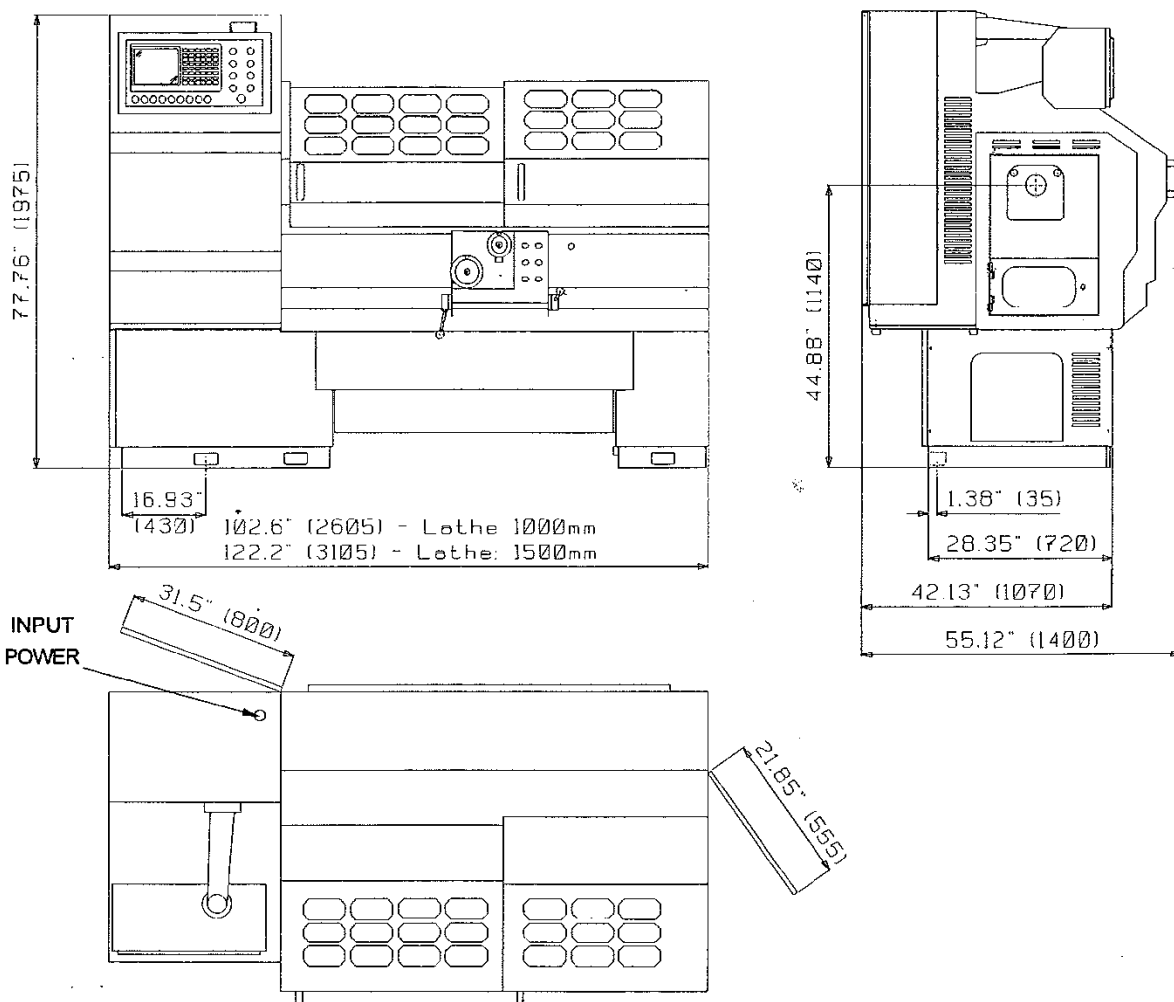


### PROTECTION CONDUCTORS MINIMUM SECTION

Phase Conductors (AWG)	Grounding Conductors (AWG)
S < 16	S
16 < S < 35	16
S > 35	0,5S

## ELECTRICAL PANEL - AIR FILTERS

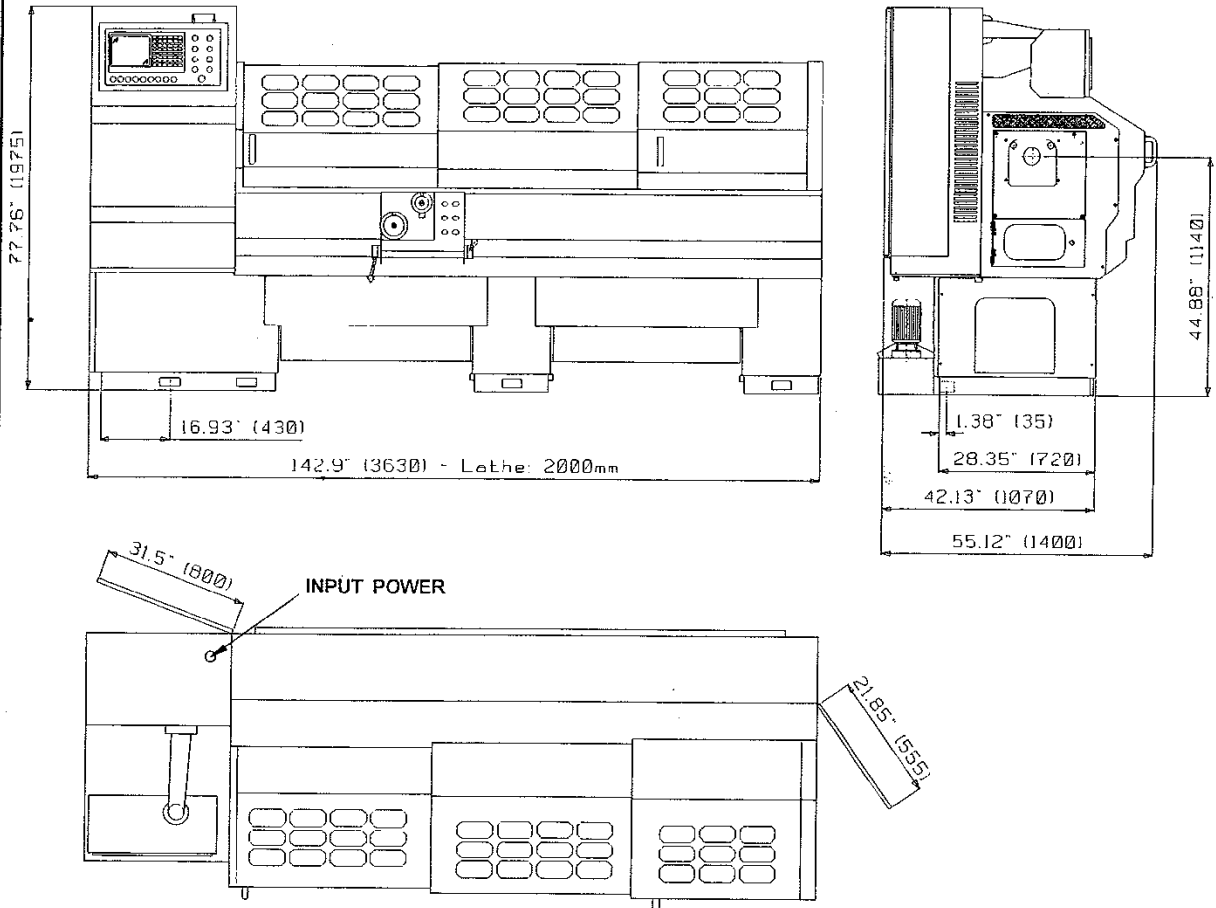
The air filters should be kept clean periodically. When the filter presents sign of wear due to dust or oil accumulation make sure to replace it.

**MACHINE LAYOUT**

=> SECOND SAFETY DOOR IS OPTIONAL

**Dimensions in inch (mm)**

## MACHINE LAYOUT



**Dimensions in inch (mm)**

## **LUBRICATION**

The EZ-PATH II SD, Version 1.0 CNC lathe, incorporates a lubricating unit that automatically lubricates guideways and ballscrews.

The recommended lubricating oil is ONG-68. Approximate use 2 liters.

### **IMPORTANT**

The machine is shipped with filled up reservoir of the automatic lubricating unit, therefore, there is no need to add oil for initial operation.

For more information see the Maintenance Manual.

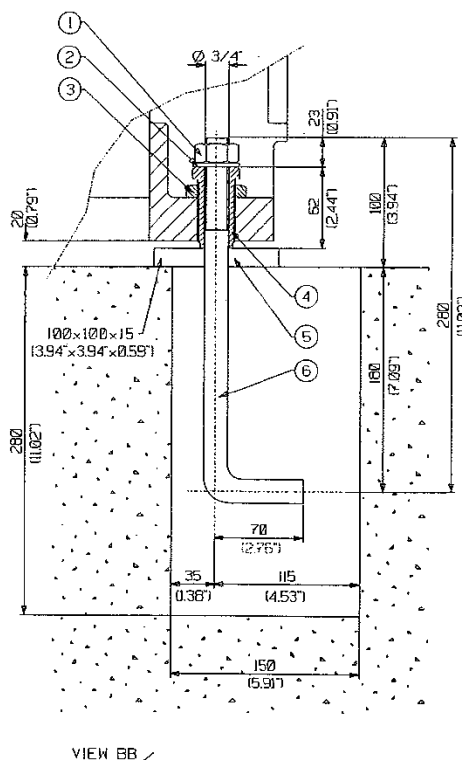
## **TABLE OF EQUIVALENT LUBRICANTS**

CODE EQUIVALENT	ONG-68
CASTROL	HYSPIN AWS 68
ESSO	NUTO H-68
SHELL OIL	TELLUS-68
TEXACO	RANDO HD-68
MOBIL OIL	VACTRA OIL N°3

ONG-68: Viscosity ISO VG 68 cSt at 40 °C (104 °F)



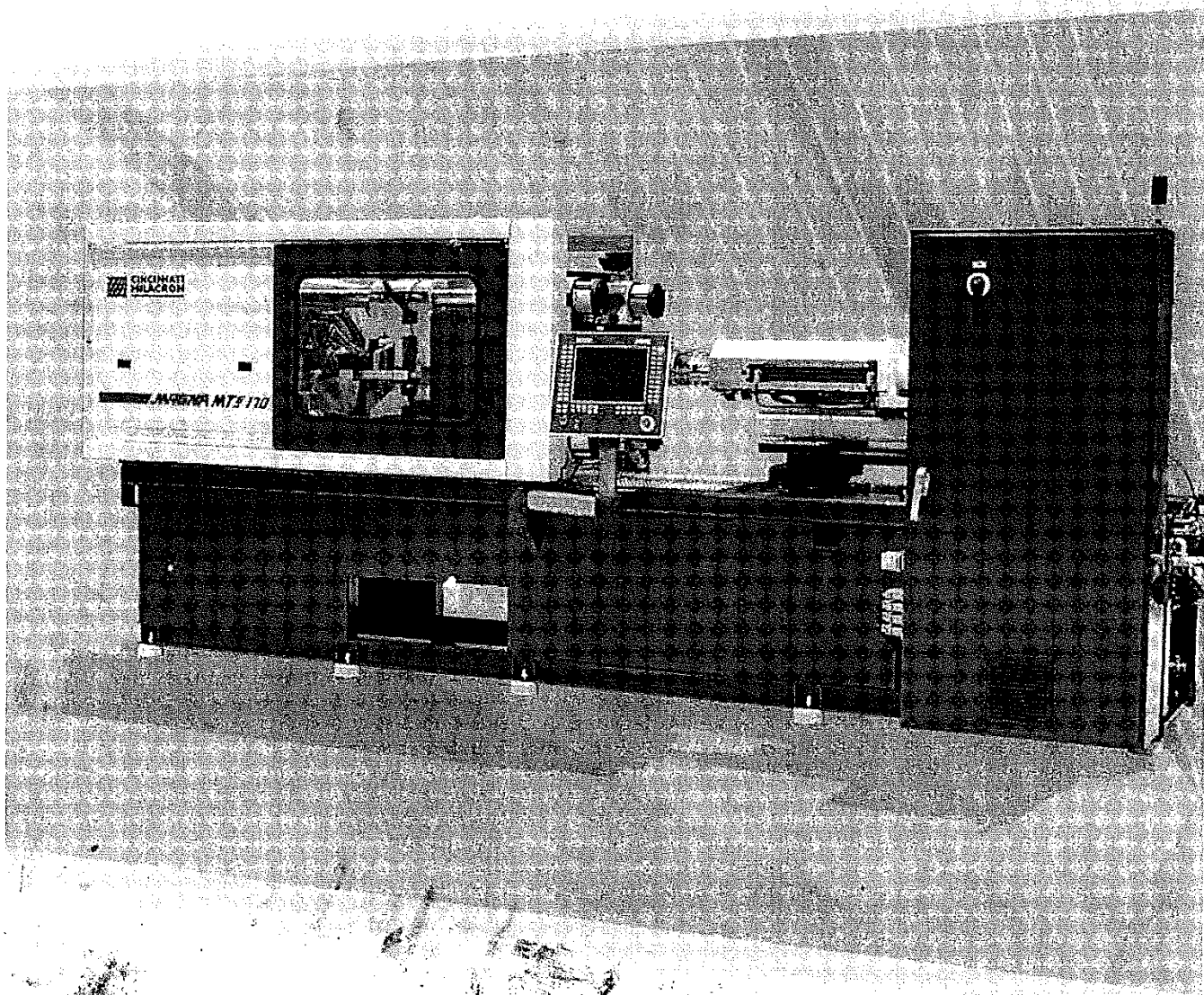
• FOR EZPATH II SD X 1,000mm AND EZPATH II SD X 1,500mm



**DIMENSIONS IN MM (INCH)**

**NOTE:** Item 1, 2, 5 and 6 are not supplied with machine

# ***MAGNA MT<sub>6</sub>***



THE **MAGNA MT<sub>6</sub>** SERIES INJECTION MOLDING MACHINES  
TOGGLE HYDRAULIC TECHNOLOGY 170 - 225 - 310 - 450 U.S. TONS  
FEATURES AND BENEFITS



**MAGMAT****170****MAGMAT****Clamp Unit Specifications**

	English		Metric	
Clamp Force	Tons	168	kN	1,500
Clamp Opening Force	Tons	16.9	kN	150
Clamp Stroke	in	17.3	mm	440
Clamp Speed				
Dry Cycle Time (typical) @ 50% stroke	sec	2.0	sec	2.0
Maximum Doglight	in	37.4	mm	950
Minimum/Maximum Mold Thickness	in	5.9 / 20.1	mm	150 / 510
Maximum Mold Wt	lbs	3,300	kg	1,500
Platen Size (H x V)	in	29.1 x 29.1	mm	740 x 740
Distance Between Tie Rods (H x V)	in	20.1 x 20.1	mm	510 x 510
Tie Rod Diameter	in	3.3	mm	85
Electro Stroke (Max)	in	5.1	mm	130
Factor Force @ 2000 psi	Tons	4.9	kN	43.6

**Machine Specifications**

Dimensions: Overall	English		Metric	
Length (with 630 II)	in	213.8	mm	5,430
Width	in	62.2	mm	1,580
Height	in	98.3	mm	2,498
Shipping weight (Est.)	lbs	15,775	kg	7,099
<b>Electric and Hydraulic</b>				
Machine Hyd. System Pressure, Max	PSI	2,950	bar	203.4
Hydraulic Pump Capacity @ 100 psi (tnh)	GPM	36	L/min	136
Variable volume capacity	GPM	28	L/min	106
Fixed volume capacity	GPM	8	L/min	30
Electric Motor	hp	25	kw	18.7
Total Oil Reservoir Capacity	gal	110	L	416
<b>Water Requirements</b>				
Heat Exchange @ 85 deg F	GPM	7	L/min	26

Injection Unit Specifications	English		Metric		A	B	C
	ozs	A	B	C			
Injection Capacity Max.		3.8	5.2	6.7	9.	108	146
67 Syringe (Theoretical)	in3	6.9	9.4	12.3	en3	113	154
Displacement							
Injection Pressure, Max	psi	36,200	26,100	21,500	bar	2,497	1,938
Injection Rate	in3/sec	7	9	12	cm3/sec	115	147
Screw Stroke	in	6.3	6.3	6.3	mm	160	160
Screw Diameter	in	1.18	1.38	1.57	mm	30	35
Screw L/D (x:c1)		22.0	22.9	20.0		22.0	22.9
<b>Screw Performance</b>							
Screw Speed, Max	rpm	625	578	505	rpm	625	578
Low Torque Screw Speed, Max	rpm	4,200	4,200	4,200	Nm	474	474
Low Torque of Screw	@psi	2,900	2,900	2,900	@bar	200	200

**Injection Unit Specifications**

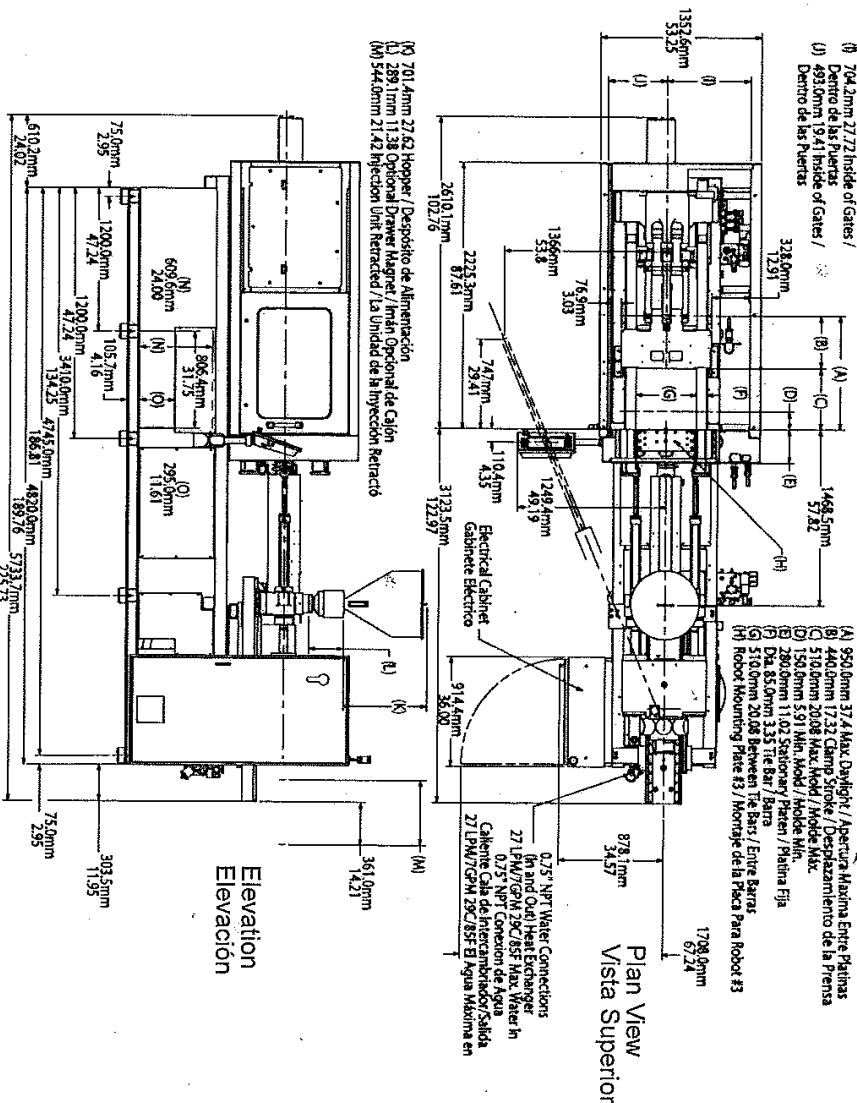
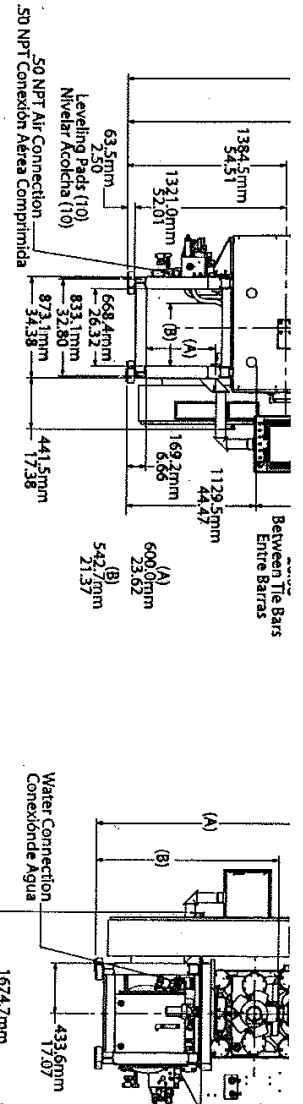
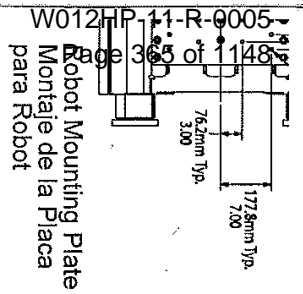
Injection Capacity Max.				
67 Syringe (Theoretical)				
Displacement				
Injection Pressure, Max				
Injection Rate				
Screw Stroke				
Screw Diameter				
Screw L/D (x:c1)				
<b>Screw Performance</b>				
Screw Speed, Max				
Torque on Screw				
Recovery Rate (67 Syringe)				
<b>Barrel Heat Control</b>				
Number of Pyrometers (Barrel/Nozzle)				
Heat Heat Capacity				

**Injection Unit Specifications**

Injection Capacity Max.				
67 Syringe (Theoretical)				
Displacement				
Injection Pressure, Max				
Injection Rate				
Screw Stroke				
Screw Diameter				
Screw L/D (x:c1)				
<b>Screw Performance</b>				
Screw Speed, Max				
Torque on Screw				
Recovery Rate (67 Syringe)				
<b>Barrel Heat Control</b>				
Number of Pyrometers (Barrel/Nozzle)				
Heat Heat Capacity				

**Injection Unit Specifications**

Injection Capacity Max.				
67 Syringe (Theoretical)				
Displacement				
Injection Pressure, Max				
Injection Rate				
Screw Stroke				
Screw Diameter				
Screw L/D (x:c1)				
<b>Screw Performance</b>				
Screw Speed, Max				
Low Torque Screw Speed, Max				
Low Torque of Screw				



## VT 440

PCP

Machine Specifications		
	English	Metric
<b>Overall Dimensions</b>		
Length (21, 29, and 34 oz)	336 in	8535 mm
with injection unit retracted	351 in	8915 mm
Length (41, 54, and 68 oz)	349 in	8864 mm
with injection unit retracted	366 in	9287 mm
Width	71.1 in	1806 mm
Height	96.1 in	2441 mm
Shipping Weight (Estimated)	38,800 lbs	17,460 Kg
<b>Electric and Hydraulic</b>		
Maximum Machine Hydraulic System Pressure	2700 PSI	185.8 bar
Total Hydraulic Pump Capacity	72 GPM	272 L/min
Electric Motor	60 hp	45 kw
Oil Reservoir Capacity	110 gal	418 L
<b>Water Requirements</b>		
Heat Exchanger*	20 GPM	53 L/min
* Based on standard motor horsepower, 85°F (29.4°C) water in, 10°F (5.5°C) temperature rise through the heat exchanger.		

Clamp Specifications		
	English	Metric
Clamp Force	440 tons	396 tons
Maximum Daylight	53.15 in	1350 mm
Mold Height (maximum/minimum)	27.56/9.84 in	700/250 mm
Clamp Stroke	25.6 in	650 mm
Clamp Speed – Dry Cycle Time (typical)*	2.6 sec	2.6 sec
Platen Size (HxV)	39.4 x 39.4 in	1000.1 x 1000.1 mm
Distance Between Tie Rods (HxV)	28.9 x 28.9 in	734 x 734 mm
Tie Rod Diameter	5.31 in	134.9 mm
<b>Hydraulic Ejection System</b>		
Eject Force	8.3 tons	7.5 tons
Maximum Stroke	5.83 in	148 mm
* Measured: Clamp open, clamp closed, build tonnage, clamp open.		

VT 440

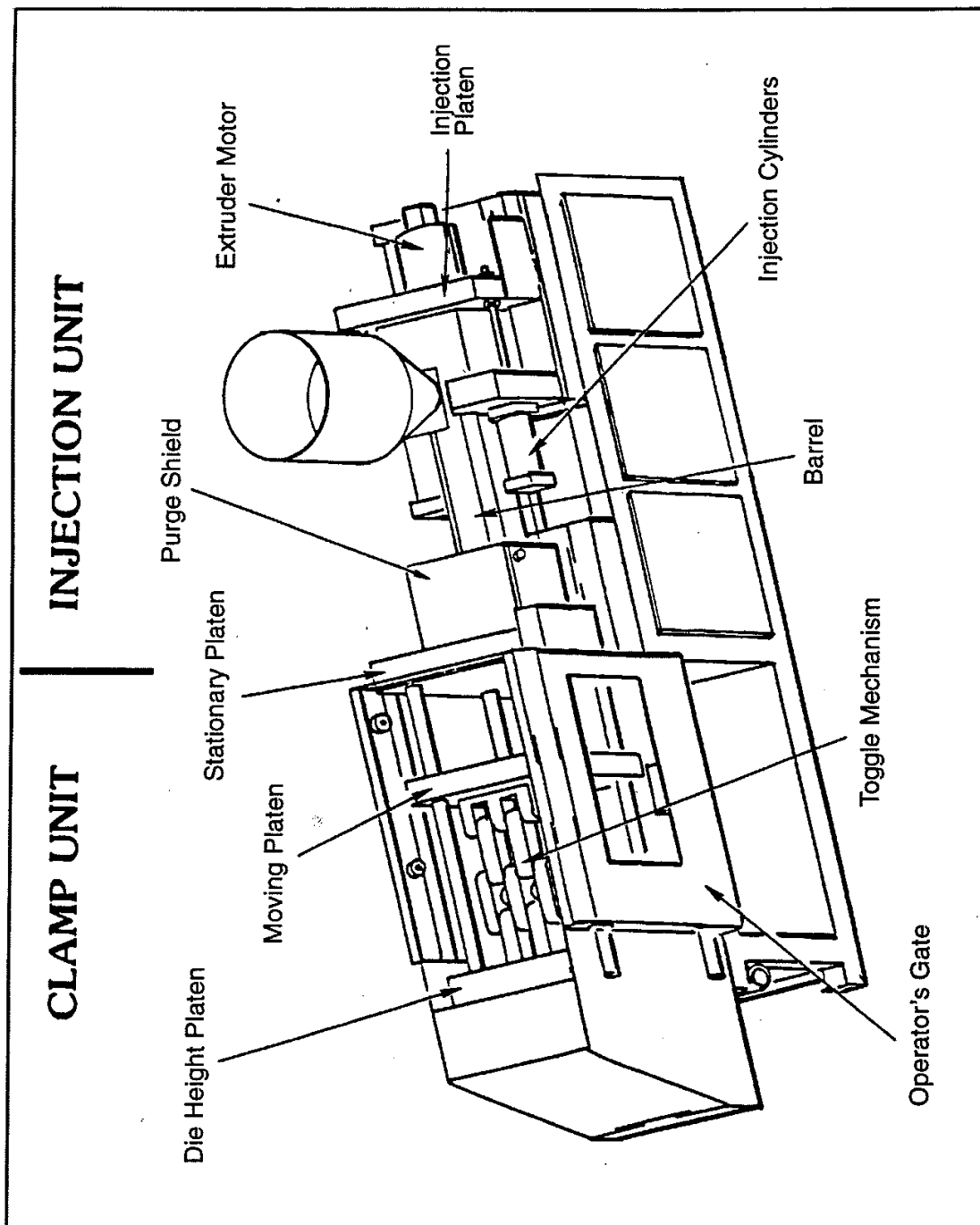


FIGURE 2-1

# APPENDIX

## DD

# **INSTALLATION DESIGN GUIDELINES**

## **FORT JACKSON, SOUTH CAROLINA**

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# **INSTALLATION DESIGN GUIDELINES**

**May, 1991**



Friday, May 27, 2011

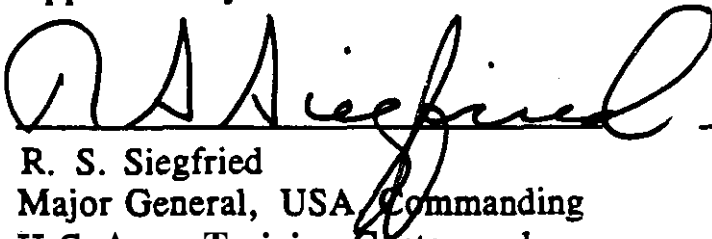


# Installation Design Guide for Headquarters U.S. Army Training Center and Fort Jackson, South Carolina

Prepared By  
hubmano-Reed & Associates, Inc.  
Atlanta, Georgia  
under the direction of

Directorate of Engineering & Housing  
Fort Jackson, South Carolina

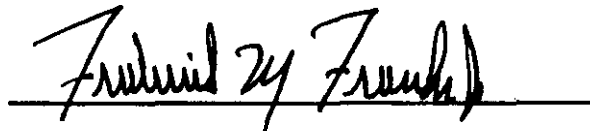
Approved by:



R. S. Siegfried  
Major General, USA, Commanding  
U.S. Army Training Center and  
Fort Jackson, South Carolina

23 MAR 92

Date



Frederick M. Franks, Jr.  
General, USA, Commanding  
U.S. Army Training & Doctrine Command  
Fort Monroe, Virginia

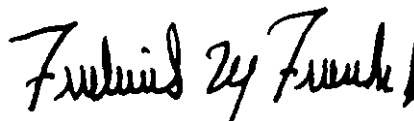
29 August '92

Date

## FOREWORD

This guide embodies the high standards your commander has established for your installation. These standards apply to all design, construction, maintenance, and repair on your installation. This guide builds on TRADOC's momentum for organizational excellence.

Comply with this common set of high standards. Teamwork is essential to mission success whether on the battlefield or on the installation. **You** are a key player on this team, and your installation commander requires your support. Compliance with these standards ensures that the Army's training base engenders individual and collective pride in our soldiers, civilians, and family members--today and tomorrow. Pride is the fuel of human accomplishment and a combat multiplier.



FREDERICK M. FRANKS, JR.  
**General**, U.S. Army  
Commanding

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# **INSTALLATION DESIGN GUIDELINES**

## **FORT JACKSON, SOUTH CAROLINA**

---

Prepared by:

Laubmann-Reed & Associates, Inc.  
505 Tenth Street, N.W. Suite 200  
Atlanta, Georgia 30318  
(404)872-2459

Architectural Consultants

Diedrich Architects & Associates, Inc. Atlanta  
A/F Contract #DACA 21-85-C-0574  
Fall 1986

Updated by:

Laubmann-Reed & Associates, Inc.  
505 Tenth Street, N.W. Suite 200  
Atlanta, Georgia 30318  
(404)872-2459

in association with:

Drafts & Jumper Architects, West Columbia, S.C.  
DACA 21-90-D-0019  
D.O. #0002





# GUIDELINE PURPOSE AND INSTRUCTIONS FOR USE

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## Introduction

Fort Jackson, Headquarters United States Army Training Center is a **U.S.** Training and Doctrine Command (TRADOC) Installation. Fort Jackson's mission includes in-processing of new recruits, basic combat training and advanced individual training. Training of Reserve Component Forces is also conducted on Post.

Fort Jackson is one of four permanent U.S. Army Training Centers. To accomplish its training mission the Post has a Reception Station and two training brigades. One of the training brigades conducts basic training (BT) and the other brigade conducts combined advanced individual training (AIT) and BT. Training Center Command, the Medical and Dental activities and numerous other Installation activities support the training mission.

As a result of the Base Realignment and Closure Act of 1991, Fort Jackson has been designated a Soldier Support Warfighting Center and as such, some notable changes occurred when the Soldier Support Center relocated from Fort Benjamin Harrison to Fort Jackson. This move consisted of the following schools being located at this installation: Finance, AG, Recruiting & Retention, and the NCO Academy. With the exception of the NCO Academy, the schools are located in a campus-style environment bounded by Lee Road, Stuart Avenue, Hampton Parkway and Benning Street. The NCO Academy is located in the 4th Brigade academic and administrative area.

Fort Jackson accommodates more than 1100 dependent families in two principle housing areas and offers a full range of recreational and community services including medical facilities at Moncrief Army Hospital.

## Purpose

The Installation Design Guidelines (IDG) addresses both the design of new facilities as well as the improvement of existing facilities and provides a comprehensive and coordinated design approach through the establishment of distinct and understandable design principles and specific guidelines. These guidelines illustrate how the built environment of Fort Jackson will be developed and modified to create a visually cohesive and attractive environment.

These Design Guidelines are to be used by the Post Command, in-house DEH staff, Savannah District Corps of Engineers and the military and civilian staffs as well as architects, landscape architects, engineers, contractors and any other person responsible for preparing requests for proposals, design contracts, construction contracts or maintenance work orders for any element or facility which would affect the exterior features of Fort Jackson.

The content of this document is designed to remain valid for many years to come; however, it is also flexible so that it can be easily revised or expanded as the need arises.



# GUIDELINE PURPOSE AND INSTRUCTIONS FOR USE

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## Organization

The Installation Design Guideline (IDG) is organized into three main sections: I Overview, II Visual Zones, and III Design Guidelines. The Design Guidelines section is subdivided into chapters and then sub-chapters. The result is a series of three numbers which identify the chapter, sub-chapter and the pages within each sub-chapter. These pages are numbered consecutively. For example, information on Architectural Character for Buildings and Courtyards begins on page 1.3.1. The numbering is represented as follows:

- 1 - Chapter (Buildings and Courtyards)
- 3 - Sub-Chapter (Architectural Character)
- 1 - Page Number

## Section I Overview

**This** section contains information on Post-wide concerns including the existing and intended images of Fort Jackson as well as listing general goals.

## Section II Visual Zones

**This** section analyzes the six land use zones at Fort Jackson, including Administration, Community Facilities, Mission Support, Housing, Open Space and Industrial land uses. The land use zones are an organizational tool to facilitate an understanding of the visual quality of each area on Post. Zones are used in the Guidelines to address features to be preserved or problems specific to a particular area. **This** section describes the types of facilities found in the zones, the intended image and objectives for the zones and any historical implications that are to be considered.

## Section III Design Guidelines

This section provides design guidance for component elements that comprise the environment at Fort Jackson. These elements include: Buildings and Courtyards, Roads and Paths, Parking, Landscaping, Site Furnishings, Signage, and Lighting and Utilities. Each chapter deals with a specific component in terms of design objectives and design guidelines of commonly observed problems, through the use of sketches and written text. Preceding these chapters is the Design Guidelines Matrix which lists all the information in the guideline and specifies what information is pertinent to each zone or each subject in question.

## GUIDELINE PURPOSE AND INSTRUCTIONS FOR USE

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In order to undertake a design project, the Post will typically develop a package containing all pertinent information from each appropriate section for the persons taking the design or maintenance action. Since the IDG is contained in a loose leaf binder, it is simple to remove the needed pages, photocopy them, and return the originals to the binder. In this manner, a guideline package can be made for any project regardless of size.

The Guidelines can be used to direct the installation of a single element such as a canopy, or it can guide the development of a whole complex, including architectural styles, accompanying paths, landscaping, benches and other site furnishings. It is imperative any new consideration for an exterior element, whether it be a bench or building, be evaluated to ensure compliance with the IDG. Designers should be given the sections of the guidelines which pertain to the needs of their specific project. In addition to continued monitoring throughout the development of a specific project, periodic inspections are also to be conducted through the Installation to verify proper maintenance procedures and in-house compliance to the IDG.

To illustrate how the IDG is used, three scenarios have been outlined: an addition to an existing building with accompanying site furnishings; siting and design of a new building and grounds; and a small site furnishings project. For each scenario, the project criteria must be established. It is important that all pertinent elements be considered so that the project is all encompassing. To find the appropriate information for the given project the following steps would be followed for the given scenarios.

### Scenario 1

#### Existing Building-Renovation Addition

1. Identify the zone in which the building is located by using the Land Use Zones Map on page 16.
2. Refer to the Design Elements Matrix on page M 1.1.1 for 'Buildings and Courtyards' and locate the land use zone at the top of the matrix. Note the page number for all applicable elements.
3. Refer to the Design Elements Matrix on page M 1.1.3-4 for 'Site Furnishings' and locate the land use zone at the top of the matrix. Note the page number for all applicable elements.
4. Turn to the specific pages within the Guideline, remove and copy them. Note any references to other pages and copy those pages. Copy section I Overview and proper zone in Section II Land Use Zones.



## GUIDELINE PURPOSE AND INSTRUCTIONS FOR USE

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### Scenario 2

#### New ~~B.I.L.~~ With Other Elements

1. Identify the zone in which the building is located by using the Land Use Zones Map on page 16.
2. Refer to the Design Elements Matrix on page M 1.1.1 for 'Buildings and Courtyards' and locate the land use zone at the top of the matrix. Note the page number for all applicable elements.
3. Refer to the Design Guidelines Matrix beginning on page M 1.1.1-5 to locate the other site elements (chapters 1-7) to be included in the project, note the page number.
4. Gather all appropriate Design Guidelines sections to be included in a summary package, including any pages referenced in the Guideline but located within another sub-chapter, Section I Overview and the proper zone in Section II Land Use Zones.

### Scenario 3

#### Site elements (chapters 2-7)

It is possible that a project may not contain any building treatment but be a combination of site elements: Roads and Paths, Parking, Landscaping, Site Furnishings, Signage or Lighting and Utilities.

1. Identify the zone in which the project is located, see Land Use Zone Map on page 16.
2. Refer to Design Guideline Matrix, page M 1.1.1-5 and locate the specific elements appropriate to the zone, noting the page.
3. **Look** up those pages in the Design Guideline, remove and copy those along with any referenced pages and any background information from Sections I and **11**.

The people who live and work at Fort Jackson require and deserve an environment of high visual quality and it is the intent of these guidelines to establish and maintain such an environment. The theme for Fort Jackson as a "Planned New Town" has been selected for the Post. The intention is to promote the Post as having an outstanding planned community environment. To compliment this training center, the living and recreational facilities for the troops, cadre, staff and their families must be equally outstanding. The two are **as** one, they cannot be separated.



# HISTORY OF FORT JACKSON

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## History

Training was the need of the hour in 1917, and throughout its history, Fort Jackson has provided just that. Carrier pigeons, war dogs, balloon and aircraft pilots, paratroopers, cavalymen and infantry men, all were to receive some part of their military training at Fort Jackson.

Camp Jackson, **as** the Post was originally designated by War Department Order No. 95, was approved by Congress in June 1917. It was assigned its first commander, Brigadier General George B. Barth, on August 26, 1917.

The original site for Camp Jackson consisted of 1,192 acres, purchased by citizens of Columbia and donated to the Federal Government. This gift initiated a long tradition of mutual concern between Fort Jackson and Columbia community leaders. Camp Jackson was named for Andrew Jackson, native son of the Palmetto State, and seventh President of the United States. **As** a soldier in the nation's service, Major General Jackson staged a spectacular American victory at the battle of New Orleans.

Plans for war that brought establishment of Camp Jackson, were in full progress by June 1917 **as** the new Post counted a complement of more than 45,000 officers and enlisted men of the 30th and 81st Infantry Divisions. The 81st "Wildcat" Division was organized at Camp Jackson, 25 August 1917 and within a year moved overseas, where its members saw action in the Lorraine and Meuse - Argonne Campaigns. The 30th "Old Hickory" Division also trained at Camp Jackson and saw battle at Flanders, Ypres-Lys and in the Somme offensive. After the departure of the 81st Division, the Installation was designated a Field Artillery Replacement Depot. Tentative plans for expansion halted with the Armistice in November 1918, and in May 1919, the 30th Division was deactivated at Camp Jackson.

The 5th Infantry Division trained at Camp Jackson until 4 October, 1921, when it was deactivated. This deactivation caused an unaccustomed silence to fall over the sandhills and pines of Camp Jackson. The reservation reverted to the control of the Cantonment Lands Commission and, from 1925 to 1939, the silence of the Post **was** broken only by four to *six* weeks training exercises of the South Carolina National Guard.

In October 1939, the streamlined 6th "Sightseeing" Division was ordered to duty at Camp Jackson. The 6th Division left the Post in the spring of 1940 and was replaced by the 30th Division when it was ordered to reorganize under the provisions of the National Guard Mobilization Act.

On August 15, 1940, Camp Jackson reverted to Federal control and was named Fort Jackson in an order from the Army Chief of Staff, General George C. Marshall. In the same month, an act of Congress designated Fort Jackson a permanent post.



## HISTORY OF FORT JACKSON

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In January of 1944, the Reception station was officially closed at Fort Jackson. Through the year of 1945, it is estimated that 500,000 men received a part of their training at Fort Jackson for the WWII effort.

Due to the outbreak of the Korean War in June 1950, the 8th Infantry Division was reactivated at Fort Jackson. All during the Korean War, the personnel Center processed inductees.

On 16 March 1956, Fort Jackson was formally designated the United States Army Training Center. Trainfire I Range, prototype for the Army, a new training concept of marksmanship began in July 1958. In July 1964, construction began on permanent steel and concrete buildings to replace wooden barracks that housed troops since the early 1940's. The Army's build-up announced in July 1965 influenced the activities of Fort Jackson. The average training load of 15,000 was increased to 20,711. Approximately 75% of range and training area communications were rehabilitated in 1965 by replacing open wire lines with telephone cable and on field telephones were replaced by dial instruments.

In 1967, Fort Jackson U.S. Army Personnel Center greeted its 1,000,000th receptee. On 9 September 1969 Columbia City Council announced a plan to annex Fort Jackson into the City of Columbia. Annexation took place 16 October 1969. Moncrief Army Hospital was dedicated 10 May, 1972. Dedication ceremony for L. Mendel Rivers Reception Station in honor of the late congressman occurred in April 1986.

Extensive work began in 1988 with the Highway Department to construct a southeastern beltway of I-77 to connect Charlotte and Charleston. This project is to be completed in 1992.

The restructuring of the Initial Entry Training (IET) units began when the 1st Basic Training Brigade transferred command and control of the 3rd Battalion, 61st Infantry Regiment to the 4th Training Brigade. The 4th Training Brigade, which formerly conducted only Advanced Individual Training (AIT) in seven military occupational specialties, assumed a Basic Combat Training (BC) mission with the addition of the 3/61st. The 4th Training Brigade added its second Basic Training Brigade in August 1990, the 2nd Battalion, 39th Infantry Regiment.

Fort Jackson became an active player for Operation Desert Shield. Upon receipt of the Second Army's Mission Directive and the initial time phased Force Deployment Listing. Fort Jackson trained over 42,000 soldiers to Army standards during 1990. In that same year, the Post became an active player in operation Desert Shield/Desert Storm when it established and operated a CONUS Replacement Center (CRC). The high influx of Personnel processing through the CRC made it necessary for this organization to become a 24 hour operation.

The year 1992, Fort Jackson will celebrate its 75th Anniversary with many historical functions scheduled in recognition of the Post.

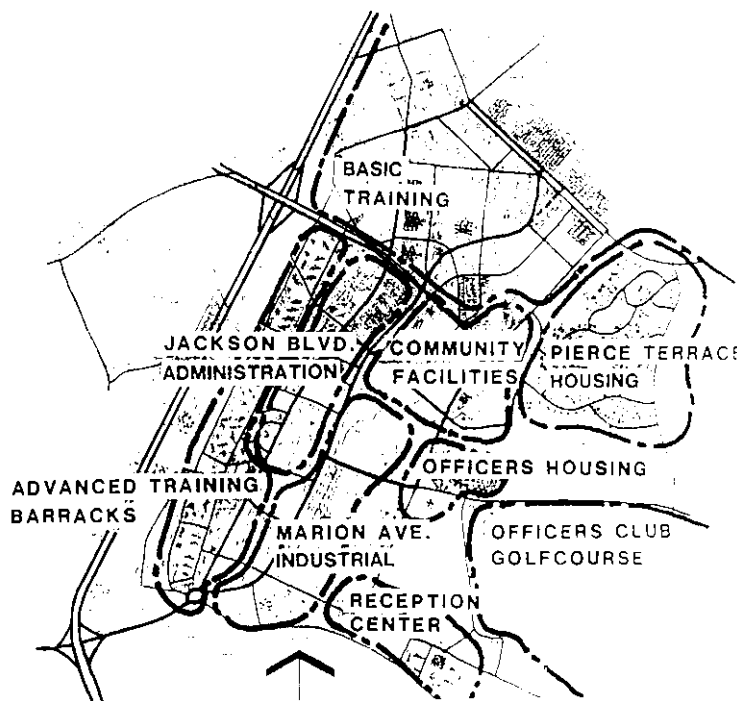


## EXISTING IMAGE OF FORT JACKSON

### Existing Image

The existing image of Fort Jackson is one of a community well into the transition from the old 'temporary' structures of the W.W.II period to a collection of widely varied contemporary permanent structures. The Post is beginning to emerge from this transitional stage as new development replaces the old. However, the successful 'NewTown' theme is not always being achieved. Development projects have, in the past, been individual efforts and have not plugged in to their immediate surroundings. A good example of this can be seen in the newer structures of the main community facilities area, many of which are well designed and beautiful structures but which do not relate well to each other or present the sense of 'Down Town' that is needed. Other areas of the Installation, those substantially developed and those soon to be so, will be developed as planned 'Small Areas'.

Also, there are few significant 'image builders' on Post, with the images of the Andrew Jackson Statue, the Headquarters Building, Moncrief Army Hospital, Sernmes Lake and the many streets lined with mature crepe myrtles being the most dominant sights on Post. The rolling topography and many small wooded stands also visually break the Post into a number of general visual districts.

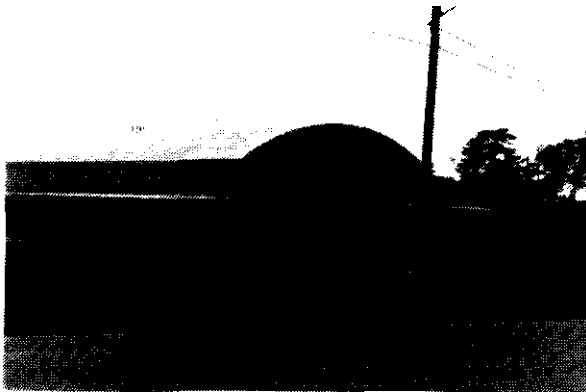


Visual districts commonly perceived at Fort Jackson

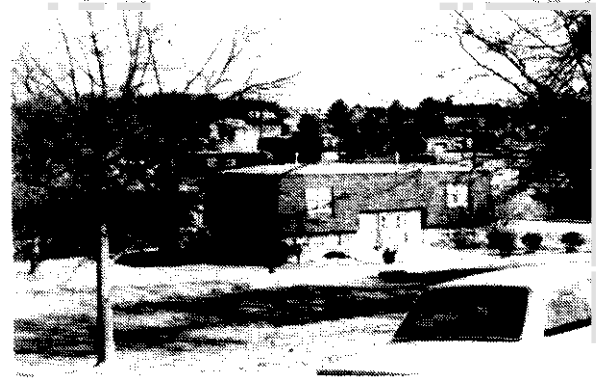


## EXISTING IMAGE OF FORT JACKSON

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At Fort Jackson one is nearly always visually aware of the Posts' architectural heritage. The white wooden structure, a gym, typifies the older buildings and is in direct contrast with the modern trainee barracks. The pine tree grove, which is common on Post, softens and relates the building to the site.



Tank Hill is not particularly impressive visually; but it is significant to the people on Post. Fort Jackson is laid out on rolling terrain, this is particularly noticeable in certain parts of the Pierce Housing area where the housing style does not relate well to the sloping site.





## INTENDED IMAGE OF FORT JACKSON

---

### Intended Image

Very little of both the original 'Camp Jackson' and those elements built in the **1940's** are of an appropriate design quality to be included **as** standard in these design guidelines. The intended image features the establishment of several distinct, small areas, that will provide spatial organization, introduction of the unifying elements of signage, site furnishings, lighting and landscaping, development of the many now unused open spaces on Post into a connecting system, and a recognition of the fragmented circulation system.

The architecture will provide visual interest throughout the Post. Due to the existing design diversity it will not be a Post-wide unifying element, but rather a way in which to establish the several 'Small Areas' of Fort Jackson. Certain stock or standard plans, usually provided by the Department of the Army, or the Corps of Engineers can be adapted to these intended images. These plans can easily be brought into compliance with a careful selection of permitted materials. Other 'stock' plans may require additional changes.

The design or adaption of plans for new structures on Post are to reflect a high quality, professional image of a well run, efficient organization. There will be a continuity of design which will require a uniform set of standards but at the same time enough variety to distinguish between Land Use Zones and prevent a boring or repetitive look. These guidelines are intended to set those standards.

New buildings or renovations on Post will generally be of an architectural character reflective of the regional, piedmont style, but are to interpret that style in a contemporary and fresh manner. Many of the recent buildings are a mix of contemporary styles, several are quite attractive, but they rarely reflect the regional style. **As** existing structures are renovated, they are to be brought into character with new buildings so that, in time there will be a common look or feel of the 'Small Areas' of Fort Jackson.

Buildings that are inconsistent with these looks will not be permitted. New designs must strictly avoid being different just for the sake of being different. Currently fashionable architectural styles, such as the "Post Modern" are to be avoided in favor of a more conservative and fundamental contemporary look; dignified, never relying on tricks for visual interest.

To strengthen this uniform image, common materials and colors have been made standard and are to be used throughout the Installation and at any remote locations attached to Fort Jackson. The single most common material will be the use of **a** limited range of brick types and colors. The standard brick types are common to the region, have historical precedents, are energy efficient, and have low maintenance requirements, but they also will carry the image of stability, strength and endurance. These same brick types are to be used in site elements such **as** walls and paving to help **unify** the Post.

Glazing is to generally be recessed under broad eaves supported by columns or pilasters to create covered walks, and to effect solar shading.



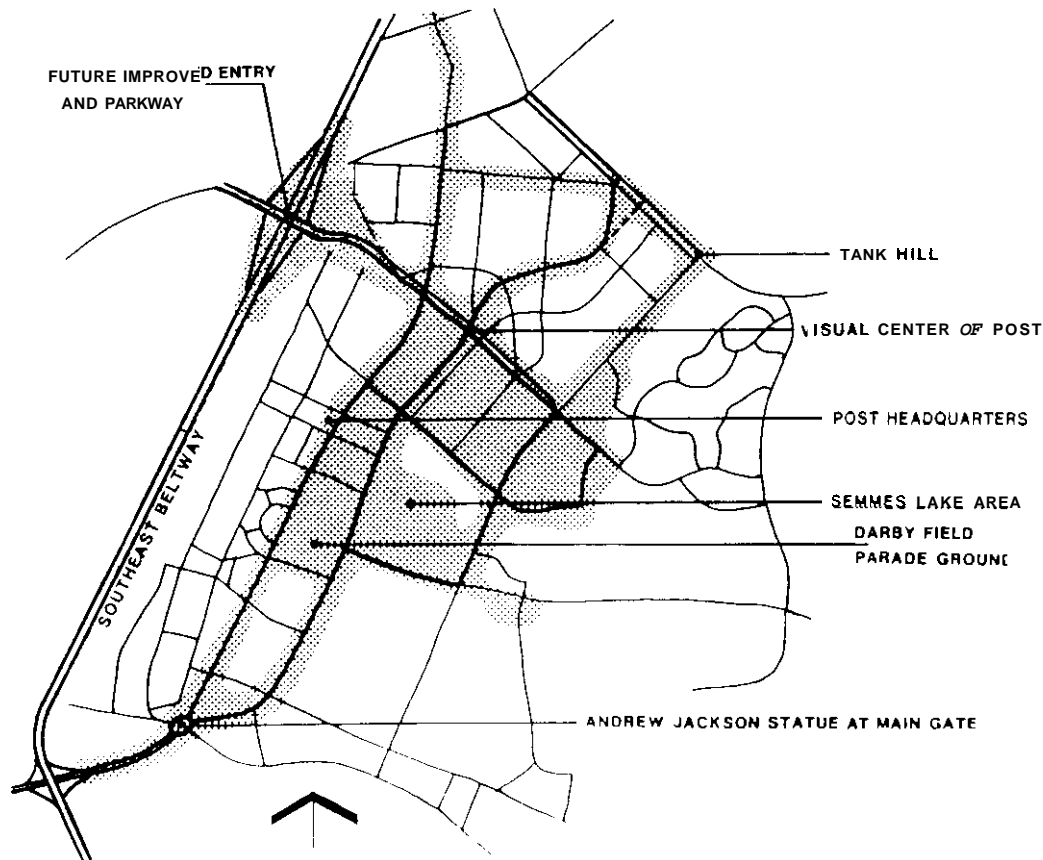
## INTENDED IMAGE OF FORT JACKSON

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A liberal amount of finished concrete or stucco like panels or banding will be utilized, to delineate important building features and as accent elements. The use of a very limited set of accent colors or tiles is also to be used to add visual interest.

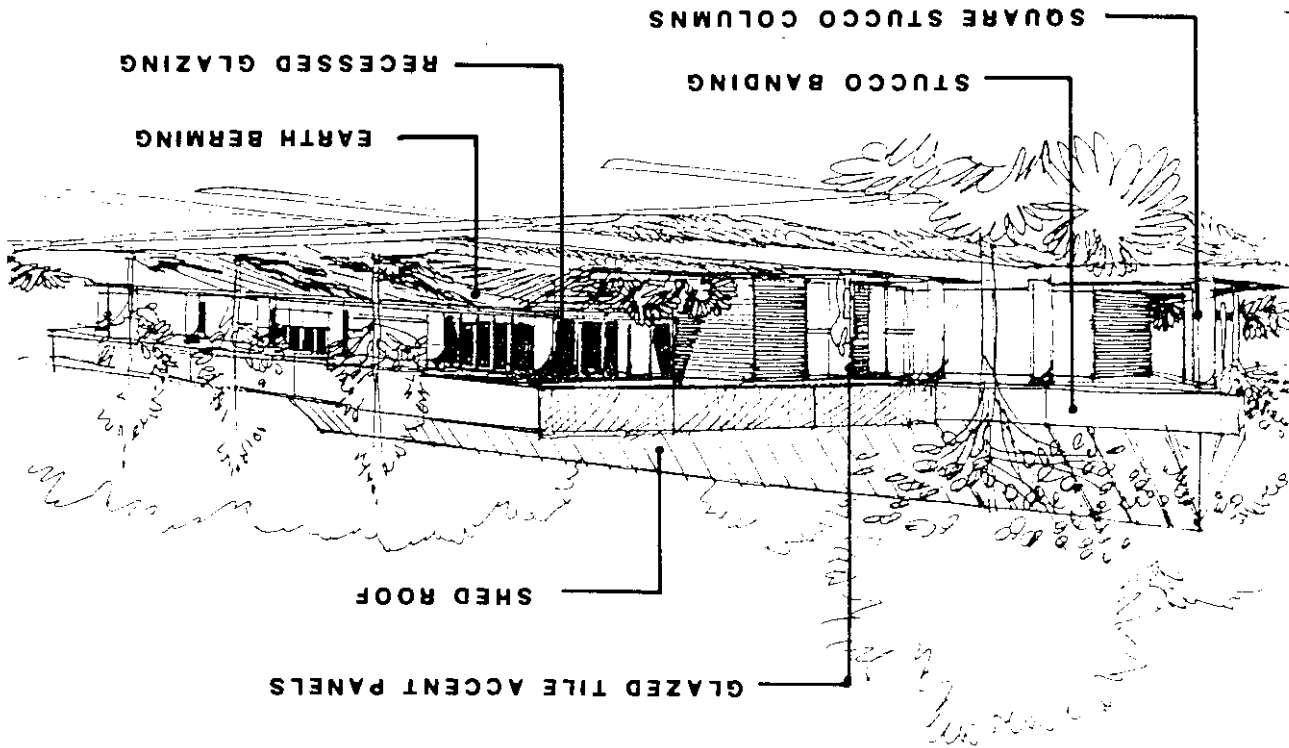
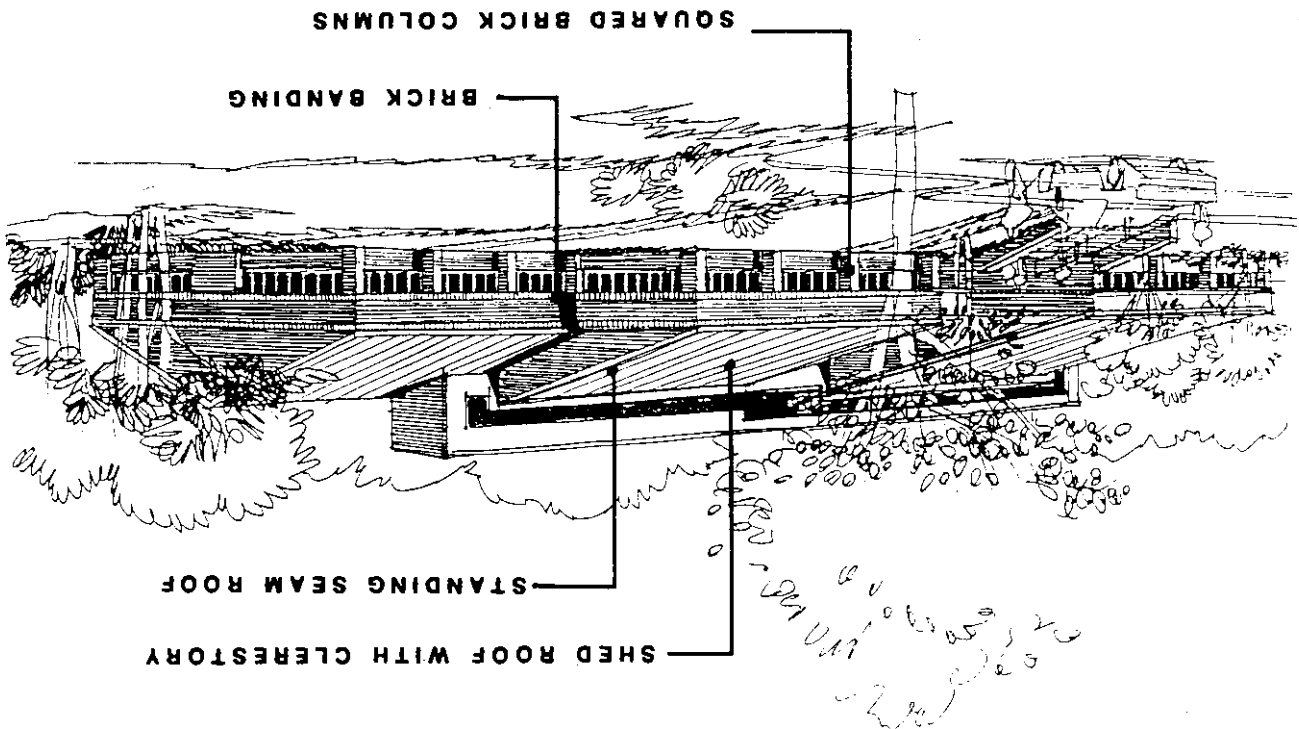
The application of these standard materials is intended to guide the design toward a uniform architecture, not to restrict their innovative or creative use, and to provide an environment of high visual quality at Fort Jackson.

The highest visibility areas of Post are to be given the strongest consideration.



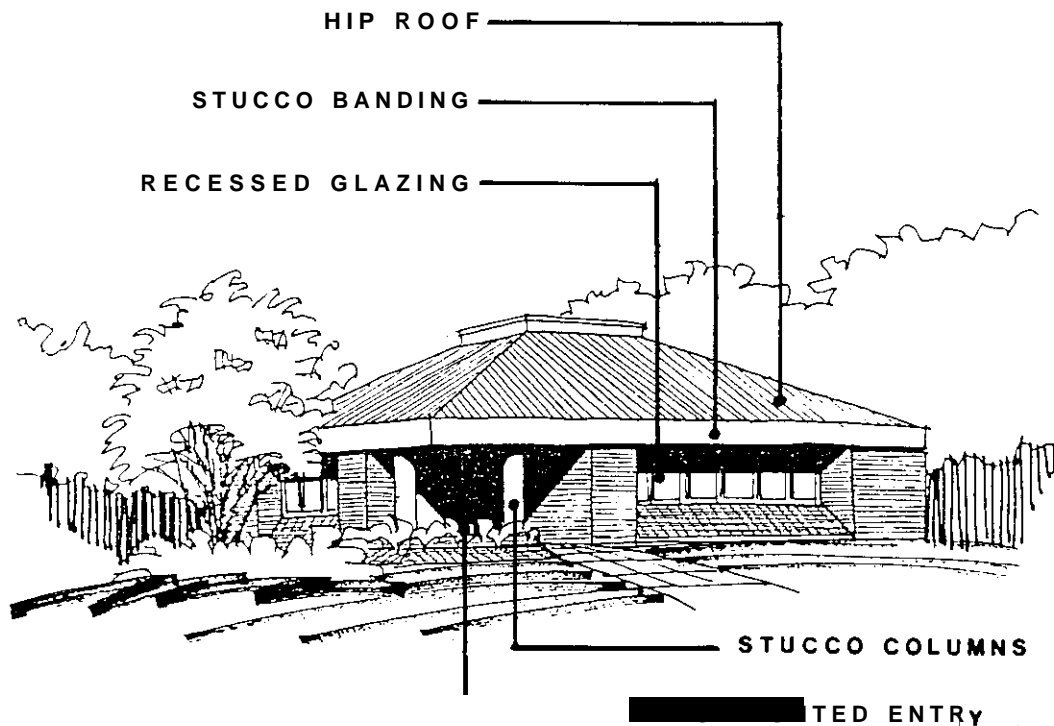
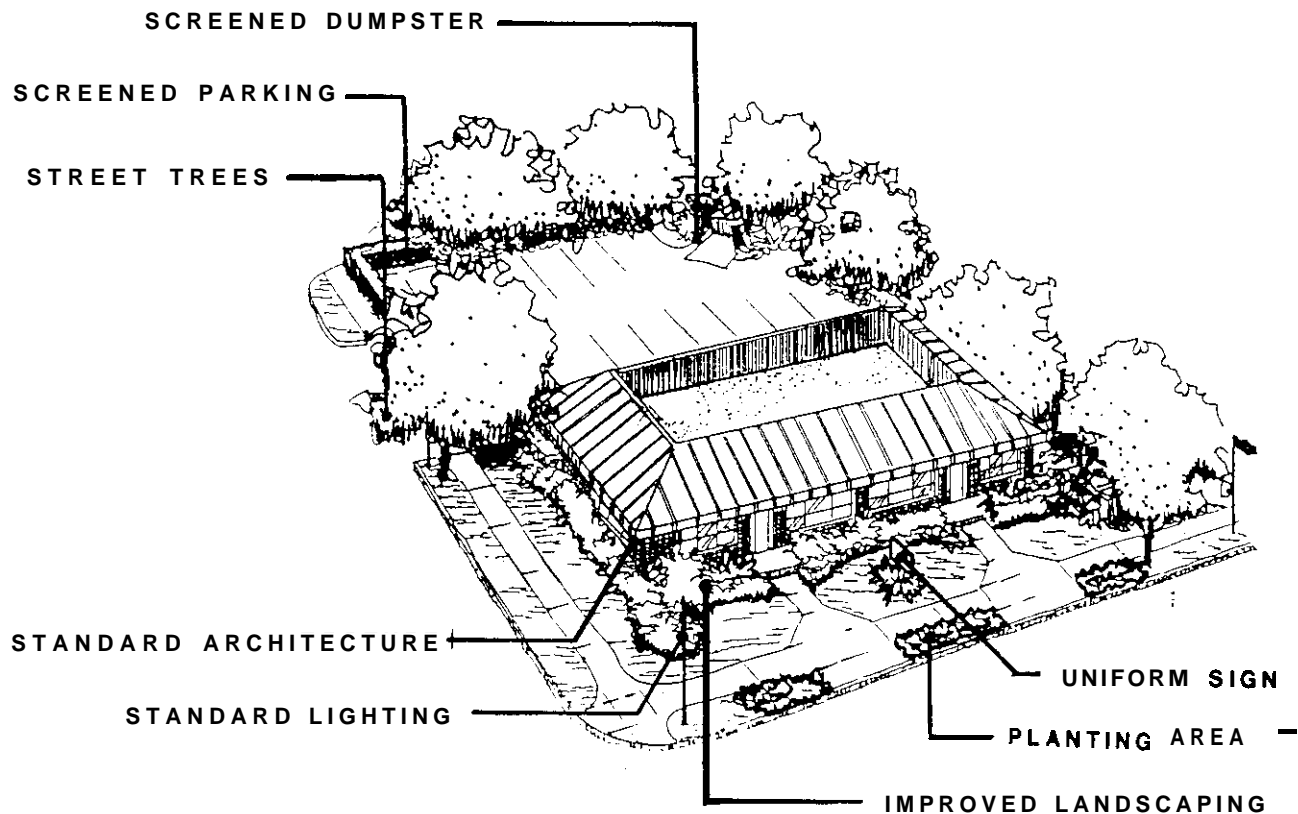
High visibility areas





INTENDED IMAGE OF FORT JACKSON

# INTENDED IMAGE OF FORT JACKSON



# GOALS FOR FORT JACKSON

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## Introduction

In order to achieve the "Planned New Town" image that has been projected for Fort Jackson, a series of goals has been identified. Each of these goals is to be generally considered in the planning and design of this project. How the project will impact the image of the Post as a whole and the particular Land Use Zone(s) and Small Area(s) where it is to be located will be addressed in the conceptual stages of design and reviewed as the project progresses.

These goals are presented in order of their projected impact on the visual environment, but each is vital to achieving the intended image for Fort Jackson.

## Goals

1. **To project a strong sense of entry** into the Post by being particularly sensitive to any projects that directly or indirectly impact the entry drives from Gates 1,2, and 3 into the Post proper. All projects are to consider any such visual impact and take measures to screen, relocate or eliminate any unsightly or utilitarian features that may occur along these routes. Also, in the planning and design of each such project, the design is to be compatible with or significantly up-grade the visual appearance of existing conditions. These considerations are also to be made at entries to any remote facilities of Fort Jackson.
2. **To establish a strong graphic image** through the strict use of the standard sign systems sited in the Design Guidelines. Non-conforming and unnecessary signs will be cause for the rejection of a design proposal.
3. **To reduce the general clutter** on the grounds by screening, removing and prohibiting design features and elements in the landscape that are unsightly, unneeded, or of a utilitarian design. The use of non-standard design elements and items of a low design quality will not be permitted. All projects are to provide for the removal or replacement of all non-standard design elements within the 'Limit of Work' designation of the site plan.
4. **To establish a master street tree canopy program** that is to generally improve the tree cover in the cantonment area of the Post. All projects are to provide for the planting of approved trees as a major part of the landscape requirements of that project. Existing trees are to be protected through imaginative and sound siting and design and by following the established procedures for protection during construction. All trees within the 'Limit of Work' designation are to be considered for such protection and for horticultural renovation as part of that project.



## GOALS FOR FORT JACKSON

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5. **To** establish a system **of** open space that will compliment and connect the existing, undeveloped open spaces now on Post. The central features of this system are to be the spaces along Wildcat Creek and the redevelopment of Darby Field Parade Ground and the proposed parkway, and new entry drive along Imboden Street once the Southeast Beltway has been built. A major monument/memorial plaza is to be the site for most major memorials on Post. Existing and proposed recreational grounds both for active and passive use are to be visually and physically joined as part of this system.
6. **To** improve the quality **of** the landscaping through the increased use of standard plant materials, and minimum maintenance designs. Planting designs are to consider likely maintenance requirements, screening capabilities, and the level of visibility the materials will receive. The use of irrigation to establish turf in high visibility areas is to be considered in all development projects.
7. **To** establish a high visibility center **for** the Post through the creation of the new main entry and parkway on Imboden Street complete with a Welcome/Information Center. This heavily landscaped drive will deliver visitors to a centrally located and formal administrative headquarters compound that is to include a ceremonial parade ground, memorial display plaza, administrative structures, improved museum facility (possibly to be located in the existing Post headquarters building), adequate parking and other required support facilities. This compound is to be designed as the dominant and most visible 'Small Area' of the Installation.
8. **To** establish 'Small Area' identities for selected places with each being a part of the larger Post but having distinctive boundaries and character. These areas are; the Administrative Center Complex, the Community Facilities Complex including the area between the Post Commissary and Marion Avenue and between Imboden and Hill Streets, the Basic Training Complex north of Imboden Street, the Fourth Brigade and School Complex, the Marion Avenue/Lee Road Industrial Complex, the Reception Center Complex, the Hampton Parkway/Reserve Center complex, the Officers Housing, B.O.Q., and Officers Club Complex, and the Pierce Terrace Housing Community.
9. **To** establish a Post-wide organization **of** space by consolidating compatible Land Uses, and establishing a hierarchy of roads and paths. Each project is to consider the immediate and the long term effect it will have on the visual quality of the 'Small Area' and of the Post as a whole. Will it fit the character of the areas and does it belong at that location. Projects that are not compatible or which disrupt a viable system such as open space or roadways, will not be permitted.



## GENERAL INSTRUCTIONS

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Every project at Fort Jackson will fall into at least one of the ~~six~~ Land Use Zones of:

- Administration
- Community Facilities
- Housing
- Industrial
- Open Space
- Mission Support

Many projects will fall into more than one of the six zones. The introductory statement and the appropriate Land Use Zone(s) information section(s) are to be included in the contract or request for proposal now being prepared.

A determination of which Zone or Zones this project will impact is to be made from the Land Use Zones Map which is a part of this Document. If a determination cannot be easily made, the descriptions for each Zone are to be reviewed for clarification.

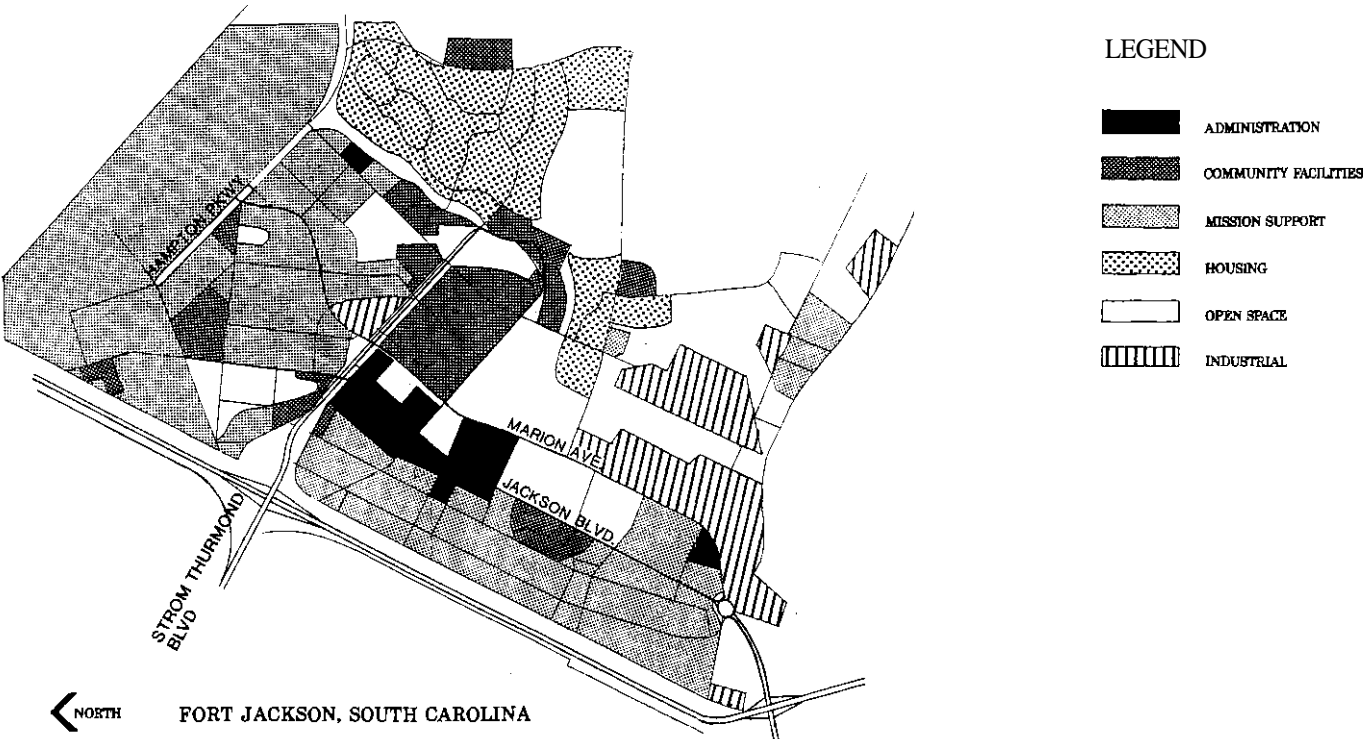
In cases, where a project crosses into another Zone, such as in a roadway project, the standards and criteria for the Zone of the Higher Design Level take precedence and are to be used to a point of logical transition. Design Levels, from the highest to the lowest are as follows:

- Administration
- Community Facilities
- Mission Support
- Housing
- Open Space
- Industrial

In cases where a structure of one Land Use lies in another Zone, the structure will take on the appearance and design standards of that Zone. Examples of this might include ~~an~~ administrative building in a Mission Support Zone or a utility or industrial facility in a Housing Zone. Non-conforming uses, if they cannot be made to look compatible with their surroundings are to be screened from view, located in a low visibility area or removed.



LAND USE ZONES





## LAND USE ZONES

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Fort Jackson has been divided into six Land Use Zones. All land on Post can be classified into one of these Zones, which are not to be confused with the five broad Land Use Areas discussed in the Analytical Environmental Assessment Report or in other Master Planning Documents.

The six Land Use Zones, which are shown on the Land Use Zones Map, available at the offices of the Directorate of Engineering and Housing, are listed in order of their level of design from highest to lowest and include:

- Administration Areas
- Community Facilities
- Mission Support Areas
- Housing Neighborhoods
- Open Spaces and
- Industrial Parks

This project has been determined to be in the \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ Zone(s).

Information pertaining to the Zone(s) in question has been included for review as part of this document. The information includes a description of the types of facilities found in the Zone(s), the intended image and objectives for the Zone(s) and, any historical implications that are to be considered.

If this project is sited in more than one Zone, the standards and criteria for the Zone of the higher level of design will take precedence and be used up to a logical point of transition. The lower level of design will then begin to be used. Thus, any street, intersection or multi-use building will be given the higher level of design treatment.

In cases where a structure of one Land Use lies in another Zone, the structure will take on the appearance and design standards of that Zone. Examples of this might include an administrative building in a Mission Support Zone or a utility or industrial facility in a Housing Zone. Non-conforming uses, if they cannot be made to look compatible with their surroundings are to be screened from view, located in a low visibility area or removed.



## ADMINISTRATIVE LAND USE ZONE

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The administrative headquarters and the principal drives leading to it should provide a dominant visual experience for the visitor, and be one of the major image builders for the Installation. The headquarters building and area at Fort Jackson are predominantly white frame, one and two story 'temporary' structures which were constructed during the early days of W.W.II. This group of buildings is split by Jackson Boulevard which lies along a low slightly rolling ridge. The area extends from the north end of Darby Field to Imboden Street and has a number of non-administrative buildings mixed in. Due to the long, relatively undisturbed nature of this area, there are several stands of mature pines that visually divide the spaces of the Zone. Also there a number of little used open spaces scattered throughout the area.

This administrative core area, the only such concentration on Post is in a period of transition to new permanent facilities and is expanding toward Imboden Street as older structures are taken down.

Other administrative buildings on Post, include the MEPS facility on Marion Avenue and the Reserve Center Headquarters on Lee Road. These along with the individual unit administration buildings are to occupy a central dominant location within their area and be of a compatible architectural style with that of the surrounding buildings. Often, these unit headquarters require relatively small buildings or are in portions of larger structures. In these cases, the entry image of the building is to be projected out by an increased use of site development elements and landscaping.

Major Administrative buildings must be;

- easily located
  - impressive architecturally
  - monumental in scale
  - rich in their materials
- oprofessional and business like in their appearance



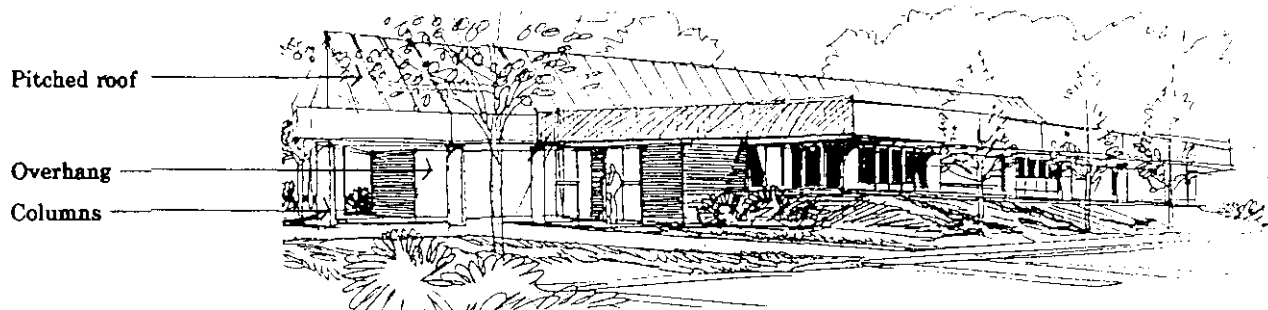
**This major administrative building relates well to regional architecture due to the pedimented portico "frontporch" and the pitched roof.**



## ADMINISTRATIVE LAND USE ZONE

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Minor administrative buildings are to be similar but less monumental. Architectural character will be a contemporary interpretation of the regional architecture.



**Administrative building prototype**

The Administrative Building Prototype picks up on regional architectural style through the use of the standing seam roof and large overhang. Its columns provide historical precedence while the strong horizontal character relates well to the clapboard style most often seen on more historical buildings.

### **Types of Administrative Areas**

There are several types of administrative areas on Post, each serving a different level of command of service. They include:

#### **Post-wide Administration**

- General Command
- Directorate Commands

#### **Unit Specific Administration Areas, Located in**

- Free standing buildings
- A section of a larger building



## ADMINISTRATIV LAND USE ZONE

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### Primary Objectives

The primary objectives for the Administrative Land Use Zone are to;

1. Provide a strong point of first impression for visitors to Fort Jackson.
2. Provide visible landmarks and occupy control areas and key points of focus in the overall layout of the Post.
3. Expose most visitors to the architectural theme and the unifying elements of signage, landscaping and site furnishings.



The entry of this administrative building lacks importance, therefore gets lost in the facade.

### Specific Objectives

More specific objectives for improving the quality of the visual environment at Fort Jackson include:

1. The creation of a 'Small Area Plan' for the main administrative core along Jackson Boulevard.
2. The creation of a major and several other high visibility entries into what is seen as the administrative core. The major point of entry is to reflect the future development of a new Post main entry and parkway along Strom Thurmond Blvd.
3. **An** increased use of the highest levels of landscaping and formal street tree plantings leading to and throughout the core area.
4. The removal of all unnecessary buildings and structures and the reassignment of all non-administrative functions from the core area.
5. The establishment of adequate, properly laid out and screened parking areas with the elimination of all head-in parking from the streets.
6. The creation of a significant, centrally located monument or memorial plaza in conjunction with the development of a new ceremonial parade ground and main administrative structure(s).
7. The ultimate relocation of the museum collection into a new, or **an** appropriate renovated structure such as the existing Post Headquarters Building. *Also*, a historically accurate grounds development of the Dozier House and restored barracks buildings area.



## ADMINISTRATIVE LAND USE ZONE

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8. The establishment of a uniform sign and graphics system.
9. The improvement of pedestrian access to and from the core area.
10. The underground relocation of overhead wiring in this high visibility area.
11. The installation of a comprehensive irrigation system in order to improve the quality of turf areas within the core.
12. All streets within the core area shall have concrete curbs and gutters with adequate sidewalks, and a positive subsurface drainage system.
13. All site furnishings and outdoor elements shall be standardized and be of the highest design and material quality on Post.

### Historic Implications

Fort Jackson has known only two headquarters buildings since its inception in 1917. Both are still in use today and stand within several hundred feet of each other along with a number of other well maintained structures that date back to the hectic early days of WW 11.

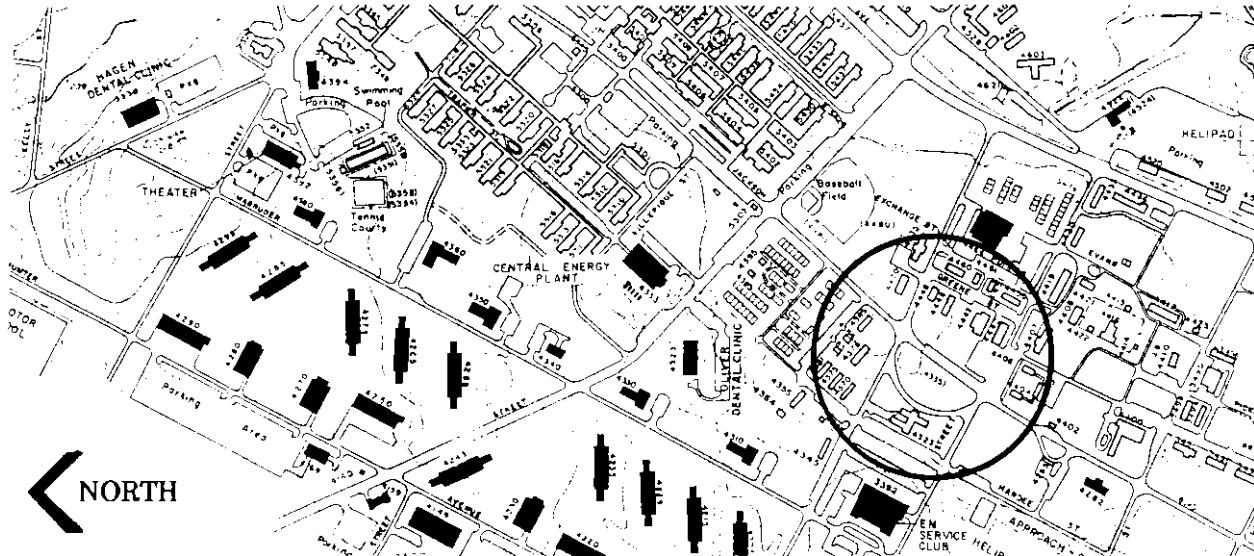
These structures were laid out as an engineered response during those busy days with little time being available for a careful planning study of this high visibility center of the Post.

These buildings have more than served their original purpose and are an important part of the history of Fort Jackson. Unfortunately, there have been a number of non-conforming intrusions into the Zone and many of the spaces are inadequate for present demands. All work to be carried out in this core area is to carefully consider existing historic structures and their layout.

Design of new elements or renovation of existing elements within or adjacent to historically significant areas should be completed in compliance with Section 106 of The National Historic Preservation Act of 1966\*, as amended. Renovation and additions in or adjacent to historically significant structures should be completed in consultation with TMS-801-2, Historic Preservation Maintenance Procedures and The Secretary of The Interiors Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1983).



# ADMINISTRATIVE LAND USE ZONE



Administrative core



## COMMUNITY FACILITIES LAND USE ZONE

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### Character

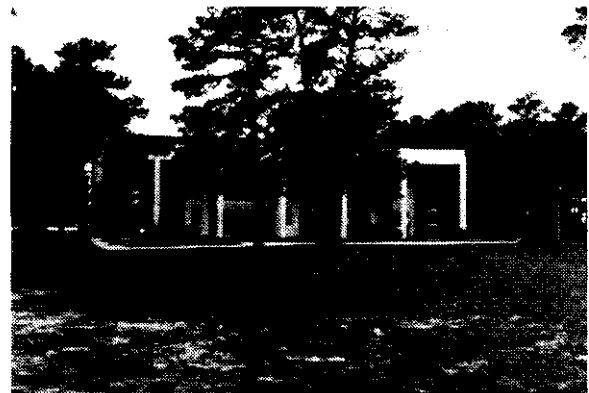
Community Facilities are important high use areas, centrally located, offering the best possible access at an appropriate scale for the facility. Typically, community facilities are groupings of services and entertainment facilities and are the primary location of social interaction. They exist on a neighborhood Post-wide scale but essentially are people oriented and are not to be dominated by the automobile or service vehicles. The feel is to be one of a downtown commercial district with ample open public space and a variety of activities available. Community Facilities should be the principal nodes of a public transportation system, and are to have easy pedestrian access for any large concentrations of daytime workers. There are three significant concentrations of such areas on Post. The primary area for this type of facility is bounded by Imboden and Hill Streets, and by Marion Avenue. Smaller community facility compounds are in the Dearing Circle area across from Darby Field and just emerging in the area of the intersection of Marion, Hampton Parkway and Kemper Street. There are other significant structures on Post, the most notable being the Officer's Club complex.

Community Facilities will be very similar to the character described for Administrative buildings, except that recreational and retail facilities will be less formal and more inviting to the user. Medical facilities shall retain the formality and professional look found in administrative buildings.

Community facilities offer the greatest opportunity for innovative design of high visibility that is to set the image of Fort Jackson.



Fort Jackson has made a conscious effort to group community facilities in a "downtown area" that is centrally located.

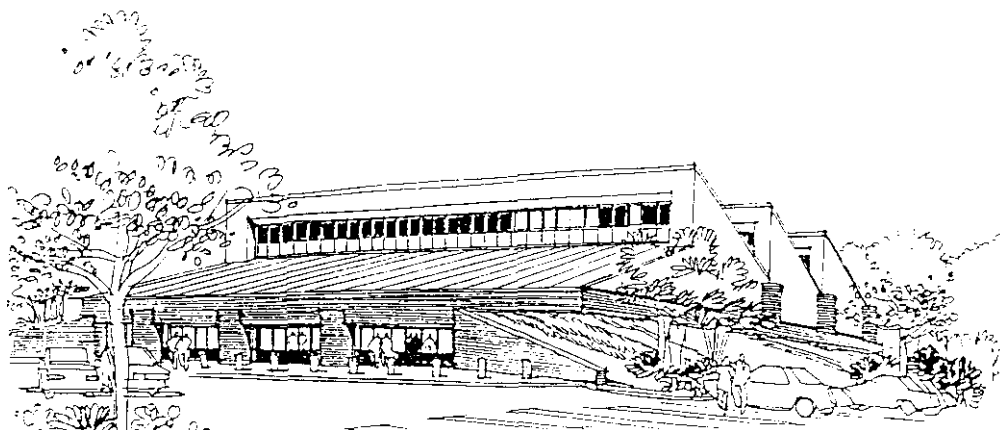


It is of great importance to retain existing vegetation when siting a new structure as shown above.



## COMMUNITY FACILITIES LAND USE ZONE

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**Community facilities building prototype**

Future community facilities shall reflect the architectural character of the region through pitched roofs, overhangs, columns and masonry walls as is evident in the prototype structure.

### **Types of Community Facility Areas**

There are several types of community facilities on Post including:

Post-wide

- Commercial-retail facilities
- Medical facilities
- Recreation facilities
- Continuing education facilities
- Cultural improvement facilities
- Community-wide lodging/accommodation facilities
- Day care centers
- Churches
- Public safety facilities





## COMMUNITY FACILITIES LAND USE ZONE

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### Primary Objectives

The primary objectives for the Community Facilities Land Use Zone are to:

1. Provide the points of principal social interaction by creating attractive community and medical facilities.
2. Provide centrally located, high visibility 'Downtown' centers with excellent vehicular and pedestrian access.
3. Create appropriate community centers for indoor recreation, cultural, spiritual and educational activities.

### Specific Objectives

More specific objectives for improving the quality of the visual environment at Fort Jackson include:

1. Designing at a human scale and providing informal gathering spaces for special events.
2. Developing a small area plan for the area from the Commissary to Moncrief Army Hospital that will create a strong sense of place as opposed to the collection of individual structures that exist now.
3. Converting Stuart Avenue to parking for the medical/dental area from Hill to Imboden Streets, and create a new entry to this complex.
4. Reviewing and reorganizing parking arrangements and amount as needed at each community facility in a shared relationship.
5. Connecting all such facilities to an open space system and providing safe pedestrian and bicycle access to major facilities.
6. Adequately landscaping and screening parking areas so they don't dominate the zone.
7. Redefining the Dearing Circle and Kemper Street facilities to be treated as specific groupings rather than individual buildings.
8. Emphasizing a high level of landscaping and detail design to be used in these areas, stressing the importance of street tree plantings.
9. Considering the use of sculptures, memorials, and water features.
10. Establishing lighting and programming for increased nighttime activity throughout the various community facilities.
11. Removing or updating inappropriate, non-standard site furnishings and structures.

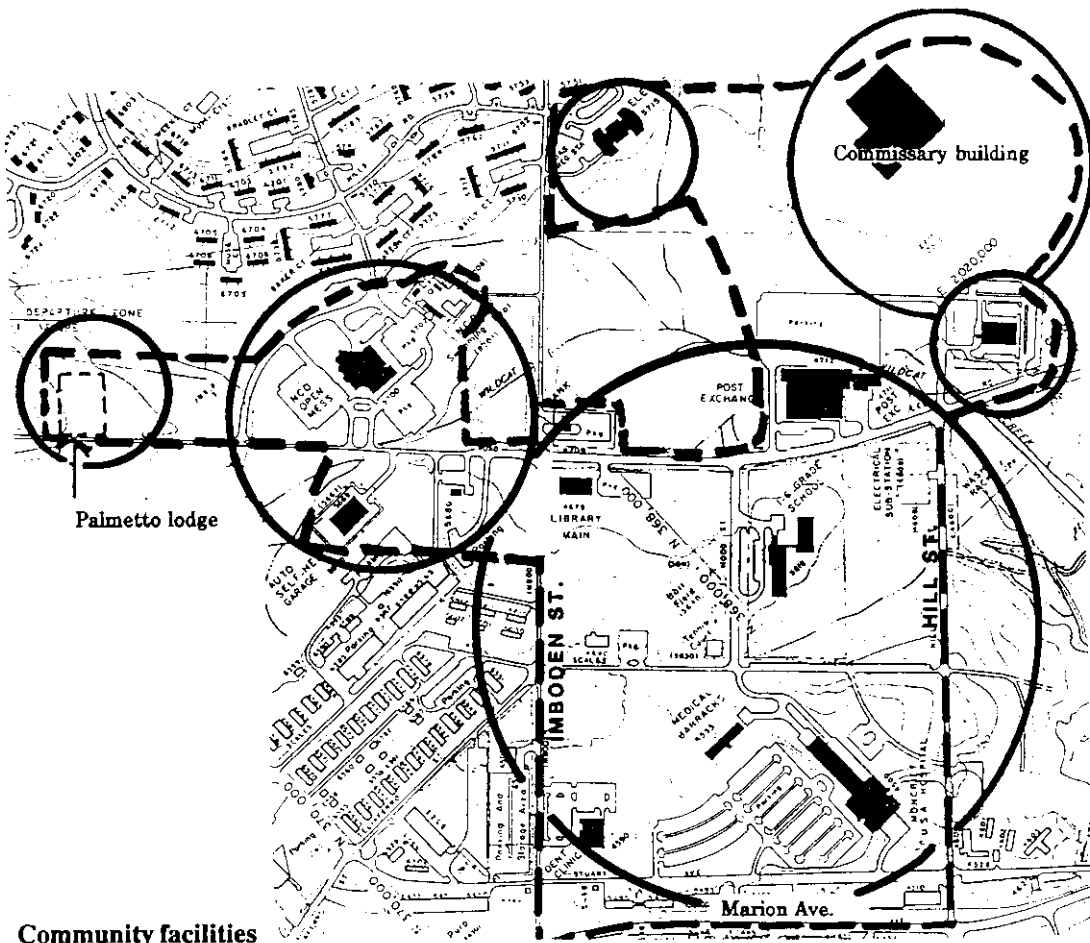


## COMMUNITY FACILITIES LAND USE ZONE

### Historic Implications

There are few of the original structures of the Post that have historical significance. Within the Community Facilities Land Use Zones, some of the original chapels, recreation halls and gymnasiums are still in use and the Fort Jackson Museum is located in several WWII era structures. Some of these buildings are architecturally interesting. As examples of the temporary construction typical of the massive buildup during WW II, some of these buildings may have historic value.

Design for new elements or renovation of existing elements within or adjacent to historically significant areas should be completed in compliance with Section 106 of the National Historic Preservation Act of 1966\*, as amended. Renovation and additions in or adjacent to historically significant structures should be completed in consultation with TMS-801-2, Historic Preservation Maintenance Procedures and The Secretary of The Interiors Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1983).



Community facilities



## MISSION SUPPORT LAND USE ZONE

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### Character

Because of the great diversity of elements of mission support it is difficult to form a visual theme. The few features common to all like the open space system, are to be standardized and the location of facilities shall appear to be planned. Training areas of high visual interest are **to** be located to take advantage of that interest and receive a higher degree of maintenance; most, however, will occur in less visible areas. Most of the mission support facilities on Post are barracks or classroom buildings and are to receive a high level of grounds maintenance. The outstanding characteristic is one of utilitarian design with little regard for appearance or aesthetics. **As** places where soldiers work, train and live, some consideration must be given to relieve the constant stark surroundings for the individual. Troop housing in areas for personnel assigned to permanent or long term duty should provide some alternatives from the daily routine.

There are four principal barracks areas on Post. The trainee barracks area (sometimes known as the 'Starships') along Jackson Boulevard are beginning to emerge **as** the dominant architectural style for the Post as well **as** at a number of other installations. The 4th Brigade barracks and school area located along Magruder and Sumter Avenues is often referred to as the 'Rolling Pin' barracks. The Reserve Training Center is housed in several blocks of wood frame buildings typical of the WW II buildup and is located on Tank Hill at the east end of Hampton Parkway. This area will soon undergo a transition to a more permanent status as these buildings are taken out of service. The last Mission Support area on Post is the highly specialized Reception Center on Ewell Road that is of a contemporary permanent architecture.

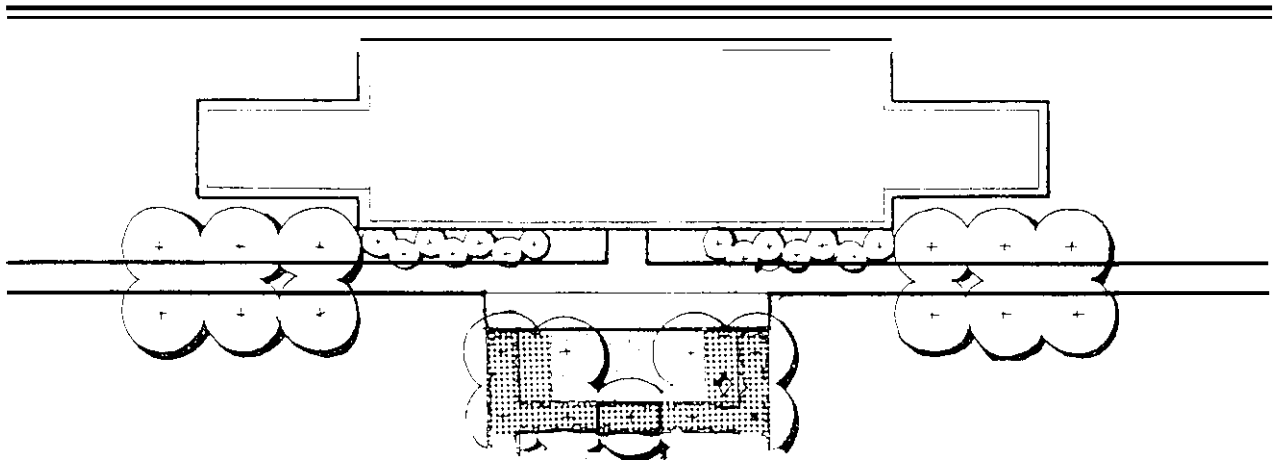
A number of functions occur within each Mission Support Zone, but the look of the grounds at these varied facilities shall be as a coordinated, planned unit.



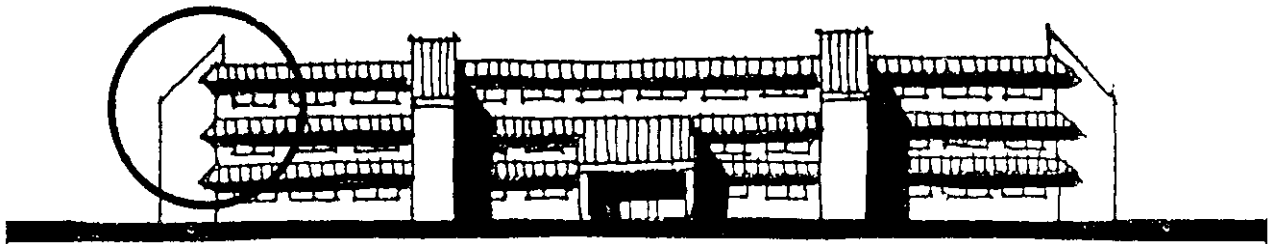
Spotty landscaping and the ever present pedestrian control devices are common liabilities in the mission support area.



## MISSION SUPPORT LAND USE ZONE



This graphic illustrates a possible solution to the common liabilities in the mission support area. Unify the buildings into a group and propose landscaping that is simple and uncluttered with site furnishings being standard throughout the zone.



**Mission Support Building Prototype**

Simple extensions to existing mission support buildings along with adaptations to the roofs combine to reflect the proposed building prototype. These extensions should include fire escape stairwells to permit use of end rooms for live-in care which cannot be used at the present time due to fire code restrictions.

### Types of Mission Support Areas

There are four basic types of Mission Support Areas and they are:

Ranges, which are specialized training grounds.

Training grounds, which hold a broad variety of specialized training structures and equipment.

Barracks areas, which house short and long term military personnel as well as dining and administrative functions.

Academic buildings and classrooms.



## MISSION SUPPORT LAND USE ZONE

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### Primary Objectives

The primary objectives for the Mission Support Land Use Zones are to:

1. Provide the soldier/student with attractive and efficient areas in which to live, study and perfect technical skills.
2. Provide the setting for a highly specialized environment that is compatible with the larger surrounding community.

### Specific Objectives

More specific objectives for improving the quality of the visual environment at Fort Jackson are:

1. To provide for small open space and physical recreation areas in the overall layout of barrack areas. *Also*, plan for adequate parking space and identify and reserve space for future parking needs.
2. To provide a well thought out troop/pedestrian circulation system with oversized walks for marching formations. This system should strongly consider the actual or projected circulation patterns rather than imposing a rigid grid on the area.
3. To create a more desirable external appearance through an increased level of architectural design and renovation including landscaping the established areas.
4. To consolidate individual unit storage buildings and lockers into small central storage areas that are screened or are architecturally compatible with the adjacent buildings.
5. The requirement that units must draw from standard site furnishings the necessary items and materials to construct individual seating and outdoor use areas within their assigned grounds and that the colors of these areas be compatible with those of adjacent buildings.
6. To locate all utility structures in low visibility areas or screen them through the use of architectural or landscape materials.
7. To use moderate to high levels of quality of design and materials.
8. The establishment of small area plans for each of the four barracks/mission support areas.
9. To review and renovate all parking areas in this zone.



Friday, May 27, 2011

## HOUSING LAND USE ZONE

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### Character

The residential areas of the Post are to present the images of being quiet, private, and secluded. **On** the whole, they need not be in close proximity to each other, but **as** blocks, can stand alone. The main theme of any residential area is to come from the site development details and not the buildings, however, a compatible architecture is desired. The theme is to be open and green, park-like, while mixing of housing types is to be avoided. The dominant features of individual neighborhoods are to be the community green spaces, landscaping and playgrounds. No housing area is to be built along major roadways or adjacent to industrial areas, and a thorough tree and landscape plan should be as evident **as** roads and sidewalks. The housing areas at Fort Jackson are well located in relation to community facilities but do appear to have a high density due to the steep site conditions and a lack of tree cover in some areas.

There is now an excessively wide variety of housing types and styles on Post. The new architectural style is to be residential in scale; informal not institutional, for multi-family **as** well as single family or duplex units. Buildings will be contemporary in design, borrowing forms from the region. Sloped roofs with overhangs are particularly important since they are the dominant elements of the regional style. Materials will be more varied than with other building types. Brick will still be used as a common and unifying element but less of it than with Administrative or Community Facility buildings due to economic constraints. A wider range of siding and roofing materials will be permitted as will the color options.

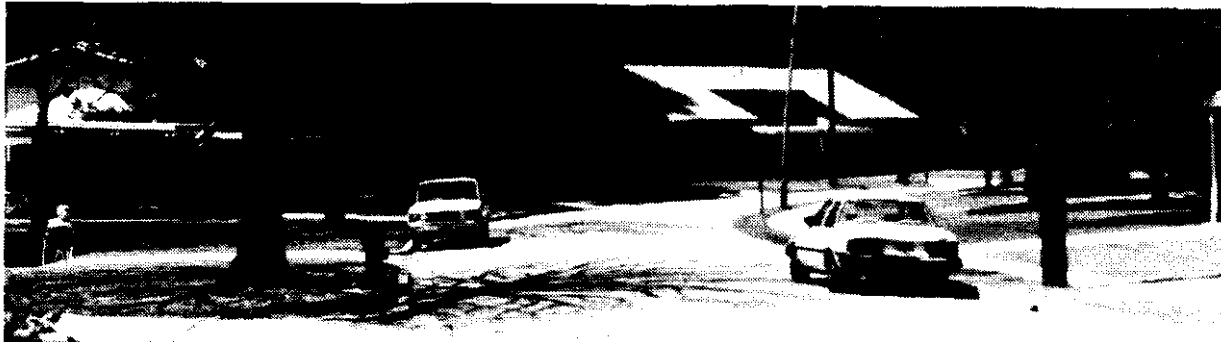
There are just two housing areas on Post. The largest area is known as Pierce Terrace and is quite diverse and extensive. The second area along Furman Smith Road known as Howie Village, is much smaller and on relatively level land. There is adequate room for expanding the housing areas.

Service buildings and screens break up the monotony of the one dimensional architecture. Unfortunately, there is a lack of landscaping to soften these screens and add character resulting in a harsh, bleak facade.



## HOUSING LAND USE ZONE

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This housing area appears planned due to the curvilinear layout of the road, the relationships of buildings to site and the street tree plantings creating a "sense of neighborhood."

### Types of Housing Areas

There are several architectural styles on **Post** which can be classified as:

Single family

Duplex

Multi-family

All housing styles are of a brick veneer, stucco, wood frame construction, or a mansard roof style with very little exterior wall surface.



## HOUSING LAND USE ZONE

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### Primary Objectives

The primary objectives for the Housing Land Use Zone are to:

1. Provide an attractive, orderly and safe residential community for the dependent families of Fort Jackson.
2. Provide a sense of privacy and separation from the larger community.

### Specific Objectives

More specific objectives for improving the quality of the visual environment at Fort Jackson include:

1. The improvement of external walls and storage facilities at some housing units.
2. The screening and/or location of utility equipment on the grounds and attached to the housing units.
3. A general relandscaping of the parking areas.
4. A restudy and improved capacity for all parking areas in this zone.
5. An improved open space and playground system in these areas.
6. Improved pedestrian and bicycle access systems within the zone and connecting to the larger Post.
7. Well defined entry areas to each of the housing areas.
8. A pedestrian/bike path system from the housing areas to each of the three schools on Post. The path along Imboden Street should be set back from the street.
9. All new housing development shall occur near or in the established Housing Zone.
10. Encouraging residents to install permanent landscape material from the approved lists. These plants are to be provided through the self help program.
11. Establishing a major street tree planting program in the sparse, open areas of Pierce Terrace.
12. Tree protection and construction measures to preserve the wooded character of the proposed sites.

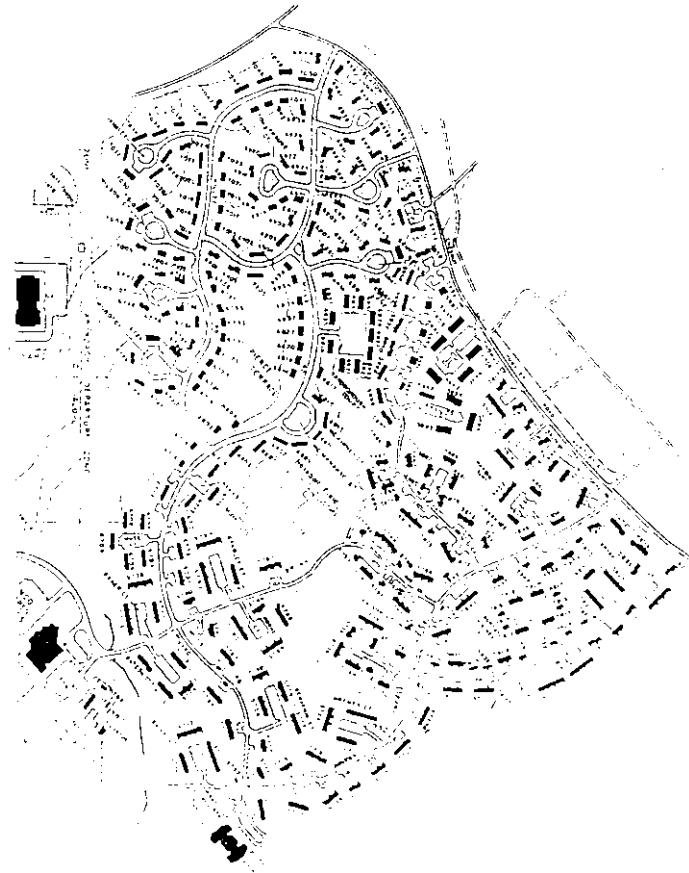


## HOUSING LAND USE ZONE

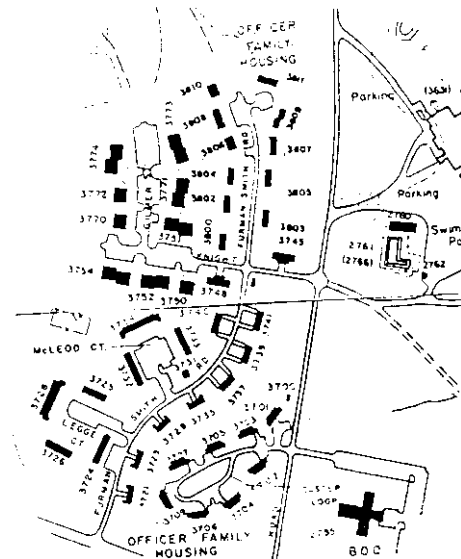
### Historic Implications

The only original housing that exists in the Old Post Administration area is the historic Dozier House. There are no other known significant structures in the housing areas.

Design of new elements or renovation of existing elements within or adjacent to historically significant areas should be completed in compliance with Section 106 of the National Historic Preservation Act of 1966\*, as amended. Renovation and additions in or adjacent to historically significant structures should be completed in consultation with TMS-801-2, Historic Preservation Maintenance Procedures and The Secretary of The Interiors Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1983).



Pierce Terrace



Officer family housing

### Housing



## OPEN SPACE LAND USE ZONE

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### Character

The single most important aspect that open space must convey is that it is a planned system and not created by default. It is to be organized and serve to tie together the destinations that exist on Post. There is a broad range of spaces, each with a different image. One as a parade field another for forest buffer, but the overriding theme is to be that each area is a planned and appropriately maintained space. On a smaller scale, forecourts and plazas will be thought of as an integral part of the building they serve, and are to appear to have been planned as part of that destination.

The opportunities for an extensive open space system reaching throughout the cantonment are great. Such a system is to be developed along Wildcat Creek and its many small tributaries and must be in accordance with wetlands and environmental policies and restrictions. A series of more formal open spaces including; Hilton and Darby Fields, Hampton Parkway, Patton Stadium, Jackson Circle, a proposed parade ground in the administrative core and the proposed Imboden Street Parkway project, will serve to carry this open space system into the more developed areas of the Post.

The Open Space Land Use Zone also includes the important entry drives and gates that are the areas of first impression for most visitors. The character of the grounds, the landscape and, to a lesser degree, the architecture is first presented during these entry sequences. Because of this, a much greater consideration and a more intense level of design and landscaping is required.

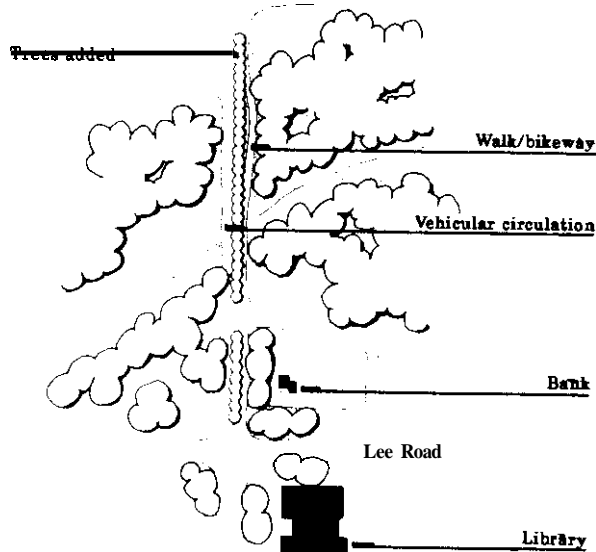
There are a number of lesser spaces serving a broad range of functions on Post. The identifying elements of each are that they are not occupied by a major structure and have identifiable boundaries. Some are planned, formal spaces, while others are irregular, "left over" spaces. Each open space is to have at least one planned purpose, but a variety of purposes is encouraged. Unused spaces will be allowed to revert to natural, forested conditions, or will be planted with desirable shade tree species so that when the land is used for future buildings a forest matrix will be present for design consideration.



**The low areas along Wildcat Creek present an excellent opportunity for the development of the main element of a Postwide Open Space System.**



## OPEN SPACE LAND USE ZONE



The above plan shows a separation between walk and road through the use of trees planted in a row. This would offer a simple solution to the lack of separation on Strom Thurmond Blvd.

### Types of Open Spaces

Open spaces can most easily be classified by intended use, of which there are two categories.

Active, which includes recreation, ceremonial and training grounds or highly specialized open areas such as entry drives and parkways. These areas are usually quite formal in design.

Passive, which includes parkways, parks, cemeteries, forests or abandoned lands. Some of these areas also receive a high level of formal design, but are much less structured in their use.

## OPEN SPACE LAND USE ZONE

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### Primary Objectives

The primary objectives for the Open Space Land Use Zone are to;

1. Establish an apparent planned system of outdoor ceremonial and recreational spaces.
2. Provide attractive settings for and frame views of structures on Post.
3. Provide spatial variety and relieve the monotony of repetitive buildings.

### Specific Objectives

More specific objectives for improving the quality of the visual environment at Fort Jackson are:

1. The reorganization and major improvements to Darby and Hilton Field Parade Grounds and their reviewing stands.
2. The establishment of an ongoing shade and street tree program and the increased use of Crepe Myrtle plantings along streets.
3. The creation of an open space/pedestrian and bicycle circulation system along Wildcat Creek, its various tributaries, and around Semmes Lake.
4. The long term removal or conversion for recreation purposes of the storage buildings along Marion Avenue just west of Semmes Lake. This area is to be developed into an open, daytime active use Park.
5. The creation of a major Monument/Memorial display space as part of the small area plan for the administrative core.
6. The renovation and general improvement of Hampton Parkway, with the creation of community services center in and around the Mansfield Loop green. A major passive use open space is to be developed within the Mansfield Loop as the barracks area develops.
7. The underground placement of overhead utility lines in high visibility locations.
8. **An** overall review and renovation of parking facilities at all points of recreational activity on Post.
9. The relandscaping and general improvements of the main entry drive leading from Gates 1. Specifically, Jackson Boulevard along its entire length shall be improved.
10. Identifying and designing the creation of open spaces as elements of an overall system of all new structures.



## OPEN SPACE LAND USE ZONE

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11. Protecting existing open spaces from encroachment by non-appropriate structures wherever practical and proposing for general redesign and renovation through signage, landscaping and circulation improvements.
12. Allowing many spaces which are now grassed areas that do not serve a valid park, foreground, recreation, or linking function to revert to forest conditions.
13. Including the cost of re-establishing such forest conditions in building demolition proposals.
14. Designing buildings such as snack bars and toilets located in open spaces to blend with the landscape as much as possible using appropriate detailing and materials.
15. Developing a series of small passive parks in or near housing areas and community facilities centers. Small formal common grounds shall be established in central areas of troop housing.

### Historic Implications

The original 'Camp Jackson' street layout has undergone significant changes over the years with the grounds around the historic Dozier House and the area of Daniel Circle being the only recognizable open spaces of note. The main parade ground of Darby Field lacks a formal arrangement and is cluttered with the remnants of temporary Company Streets. Hampton Parkway, Jackson Circle and the Mansfield Loop area have some historic value.

Design of new elements or renovation of existing elements within or adjacent to historically significant areas should be completed in compliance with Section 106 of the National Historic Preservation Act of 1966\*, as amended. Renovation and additions in or adjacent to historically significant structures should be completed in consultation with TMS-801-2, Historic Preservation Maintenance Procedures and The Secretary of The Interiors Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1983).



## INDUSTRIAL LAND USE ZONE

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### Character

Industrial areas on Post are primarily for storage or maintenance purposes and are, by their nature, active work zones that the general population rarely encounters. Utilitarian in appearance, these yards often accommodate a wide variety of equipment and structures that do not require a coordinated unified look. The primary layout determinant of industrial areas lies in a functional, vehicular circulation system and rail access. The points of contact with the larger Post provide the principal image of each such zone.

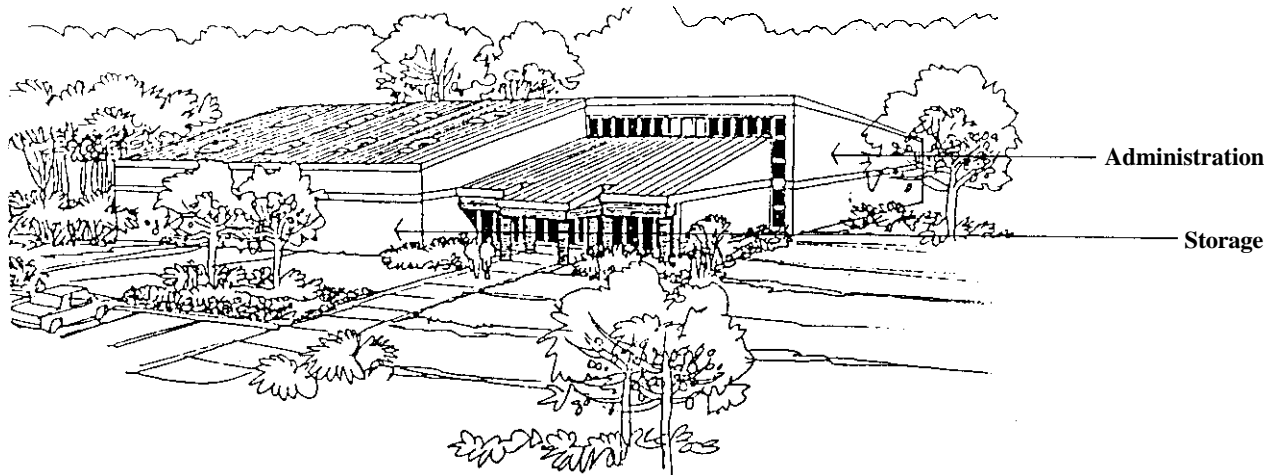
The visual theme of these mixed utility, production and storage areas is to be downplayed and reduced in impact. They are to have the character of an industrial park. The point of exposure to the community at large is to be little more than an entrance and an architecturally attractive, or landscaped fence or wall. A consolidation of industrial uses away from the central areas of the Post is needed, with one or several secure points of entry being established. One practical benefit from this consolidation is the creation of controlled security areas which are desirable on an open post like Fort Jackson. These industrial parks are to be more secure locations for critical utility and communication structures that are now vulnerable to disruption. The points of entry will be landscaped, and extend to at least the administrative/receiving areas of the park. Additional green pockets are to be located near concentrations of employees, in now unused spaces. The majority of these areas will retain, however, their utilitarian image. There is an abundance of these areas on Post and the total amount of industrial space is to be organized and consolidated.

The architectural character for industrial buildings is frequently influenced by functional and economic constraints. **To** preserve a high quality image for the Post as a whole, industrial buildings located in other Land Use Zones or along major arteries are to have a very high quality appearance. When located in other Land Use Zones, the architectural character will be the same **as** stated for that particular Zone. When located along a major artery, the building character will be the same as for administrative office buildings **as** viewed from the roadway but only where screening or separation is not possible. This appearance can be facilitated by locating the office portion of the building along the main artery side of the building. Industrial buildings not visible from other areas will have a more utilitarian appearance, but will still have some of the common materials: brick and metal roof/siding, particularly at the main entry to the building.



## INDUSTRIAL LAND USE ZONE

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**Industrial building prototype**

Due to the relatively low architectural quality of industrial buildings, they should be softened or screened in areas viewed by the public. The illustration above shows how an industrial building can be modified to present a better visual image.

### **Types of Industrial Areas**

The three basic types of industrial operations on Post usually share the design feature of being a series of utilitarian buildings with a large yard and enclosed by a chainlink fence. The three types are:

Storage yards, which provide for vehicle and material storage.

Shops, which house fabricating, assembly and maintenance operations.

Warehousing, which provide covered storage.



## INDUSTRIAL LAND USE ZONE

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### Primary Objectives

The primary objectives for the Industrial Land Use Zone are to:

1. Provide for storage or maintenance needs of the Post in a remote, low visibility location.
2. Provide a single major area, as an "Industrial Park" facility that is rarely encountered by the Post population.
3. Provide a clear, well organized work space for industrial activity employees of the Post.

### Specific Objectives

More specific objectives for improving the quality of the visual environment at Fort Jackson are to:

1. Consolidate industrial operations into one major "Controlled access" compound in the Marion Avenue, Lee and Washington Roads area.
2. Relocate existing smaller facilities throughout the Post to the central facility, wherever practical.
3. Establish a similar centrally located, troop support motor pool facility in the basic training/reserve training area.
4. Give a high level of design treatment and landscaping to the facility and its visible perimeter fences.
5. Establish external employee parking areas near pedestrian entries that are well lit.
6. Locate office and administrative structures in or near these perimeter lots and they should be of a higher architectural quality than the structures they are attached to.
7. Provide outdoor seating and appropriate lunch time recreational areas near concentrations of workers.
8. Arrange these industrial compounds to be neat and orderly on an established grid that can accommodate rail and truck traffic.
9. Locate industrial activities that are visited regularly by the Post population such as self help centers near the entries to the designated Industrial Park.
10. Screen remote industrial facilities such as the electrical substation or let it take on the character of the surrounding zone as much as possible.

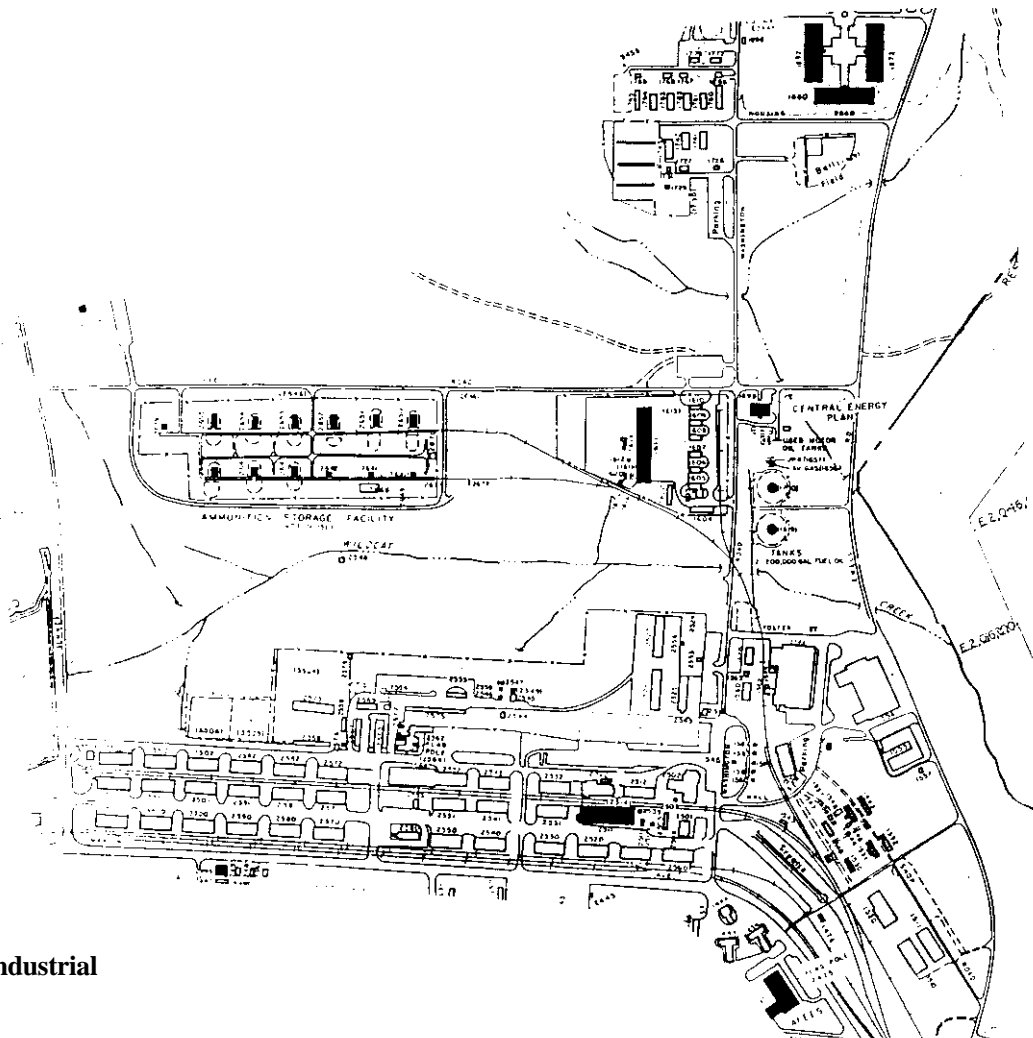


## INDUSTRIAL LAND USE ZONE

### Historic Implications

Historically, the areas now used for industrial operations have been located along Wildcat Creek. There are several older warehouses west of Marion Avenue that may be historically interesting. Building **2495** is the oldest permanent industrial structure on Post and lies just west of Marion Avenue.

Design for new elements or renovation of existing elements within or adjacent to historically significant areas should be completed in compliance with Section 106 of The National Historic Preservation Act of 1966\*, as amended. Renovation and additions in or adjacent to historically significant structures should be completed in consultation with TMS-801-2, Historic Preservation Maintenance Procedures and The Secretary of The Interiors Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1983).



Industrial



# DESIGN GUIDELINE MATRIX

## SITE ELEMENTS

	Admin.	Comm. Facilities	Mission Support	Housing	Open Space	Industrial
<b>BUILDINGS AND COURTYARDS</b>						
General Information	1.1.1 to 5	1.1.1 to 5	1.1.1 to 5	1.1.1 to 5	1.1.1 to 5	1.1.1 to 5
Site Plan Types	1.2.1,3-5	1.2.1 to 5	1.2.1 to 5	1.2.1,3-4	1.2.1,3-4	1.2.1,3-4
Architectural Character	1.3.1 to 2	1.3.1 to 2	1.3.1 to 2	1.3.1 to 3	1.3.1 to 2	1.3.1 to 3
New Building Prototypes	1.4.1 to 2	1.4.1 to 3	1.4.2 , 4-5	1.4.6 to 7	NA	1.4.8
Color and Materials	1.5.1 to 3	1.5.1 to 3	1.5.1 to 3	1.5.1 to 3	1.5.1 to 3	1.5.1 to 3
Climatic Conditions	1.6.1 to 7	1.6.1 to 7	1.6.1 to 7	1.6.1 to 7	1.6.1 to 7	1.6.1 to 7
Building Signage	1.7.1 to 2	1.7.1 to 2	1.7.1 to 2	NA	NA	1.7.1 to 2
Outbuildings	1.8.1 to 5	1.8.1 to 5	1.8.1 to 5	1.8.1 to 5	1.8.1 to 5	1.8.1 to 5
Renovations & Additions	1.9.1 to 5	1.9.1 to 5	1.9.1 to 5	1.9.1 to 5	1.9.1 to 5	1.9.1 to 5
Entrances & Access	1.10.1 to 4	1.10.1 to 4	1.10.1 to 4	1.10.1 to 4	1.10.1 to 4	1.10.1 to 4
Covered Walkways	1.11.1 to 2	1.11.1 to 2	1.11.1 to 2	NA	NA	NA
Plazas & Courtyards	1.12.1 to 3	1.12.1 to 3	1.12.1 to 3	NA	NA	NA
Adaptive Design	1.13.1	1.13.1	1.13.1	1.13.1	1.13.1	1.13.1
Mechanical Equipment and Building Services	1.14.1	1.14.1	1.14.1	1.14.1	1.14.1	1.14.1
Compatibility	1.15.1 to 4	1.15.1 to 4	1.15.1 to 4	1.15.1 to 4	1.15.1 to 4	1.15.1 to 4
<b>ROADS AND PATHS</b>						
General Information	2.1.1 to 2	2.1.1 to 2	2.1.1 to 2	2.1.1 to 2	2.1.1 to 2	2.1.1 to 2
Road Hierarchy	2.1.1 to 6	2.1.1 to 6	2.1.1, 7-11	2.1.1,7-11	2.1.1 to 12	2.1.1-6, 12, 13
Alignment	2.3.1	2.3.1	2.3.1	2.3.1	2.3.1	2.3.1
Road Expansion	2.4.1	2.4.1	2.4.1	2.4.1	2.4.1	2.4.1
Median Cross Sections	2.5.1	2.5.1	2.5.1	2.5.1	2.5.1	2.5.1
Intersections	2.6.1 to 4	2.6.1 to 4	12.6.1 to 4	12.6.1 to 4	2.6.1 to 4	12.6.1 to 4
Sidewalks	2.7.1 to 8	2.7.1 to 8	2.7.1 to 8	2.7.1 to 8	2.7.1 to 8	2.7.1 to 8



# DESIGN GUIDELINE MATRIX

## SITE ELEMENTS

	Admin.	Comm. Facilities	Mission Support	Housing	Open Space	Industrial
<b>ROADS AND PATHS (CONT.)</b>						
Ramps and Steps	2.8.1 to 2	2.8.1 to 2	2.8.1 to 2	2.8.1 to 2	2.8.1 to 2	2.8.1 to 2
Crosswalks	2.9.1	2.9.1	2.9.1	2.9.1	2.9.1	2.9.1
Bike Path System	2.10.1 to 8	12.10.1 to 8	2.10.1 to 8	2.10.1 to 8	2.10.1 to 8	2.10.1 to 8
Bank Stabilization	to 2	to 2	to 2	to 2	to 2	to 2
Design Objectives	3.1.1	3.1.1	3.1.1	3.1.1	3.1.1	3.1.1
General Criteria	3.2.1 to 3	3.2.1 to 3	3.2.1 to 3	3.2.1 to 3	3.2.1 to 3	3.2.1 to 3
General Information	3.3.1	3.3.1	3.3.1	3.3.1	3.3.1	3.3.1
Handicap Access	3.4.1	3.4.1	3.4.1	3.4.1	3.4.1	3.4.1
Circulation and Layout	3.5.1 to 4	3.5.1 to 4	3.5.1 to 4	3.5.1 to 4	3.5.1 to 4	3.5.1 to 4
Setbacks	3.6.1	3.6.1	3.6.1	3.6.1	3.6.1	3.6.1
Parking Arrangements	3.7.1 to 4	3.7.1 to 4	3.7.1 to 4	3.7.1 to 4	3.7.1 to 4	3.7.1 to 4
Paving, Markings & Materials	3.8.1 to 2	3.8.1 to 2	3.8.1 to 2	3.8.1 to 2	3.8.1 to 2	3.8.1 to 2
Landscaping	3.9.1 to 4	3.9.1 to 4	3.9.1 to 4	3.9.1 to 4	3.9.1 to 4	3.9.1 to 4
Planting Islands	3.10.1	3.10.1	13.10.1	13.10.1	13.10.1	3.10.1
Buffers or Screens	3.11.1 to 2	3.11.1 to 2	13.11.1 to 2	13.11.1 to 2	13.11.1 to 2	13.11.1 to 2
Loading Docks & Service Areas						
<b>LANDSCAPING</b>						
Design Objectives	4.1.1	4.1.1	4.1.1	4.1.1	4.1.1	4.1.1
General Information	4.2.1 to 4	4.2.1 to 4	4.2.1 to 4	4.2.1 to 4	4.2.1 to 4	4.2.1 to 4
Plant Material	4.3.1 to 14	4.3.1 to 14	4.3.1 to 14	4.3.1 to 14	4.3.1 to 14	4.3.1 to 14
Entry Planting	4.4.1 to 6	4.4.1 to 6	4.4.1 to 6	4.4.1.7-10	4.4.1,12-13	4.4.1, 11



# DESIGN DELINE MATRIX

## SITE ELEMENTS

	Admin.	Comm. Facilities	Mission Support	Housing	Open Space	Industrial
LANDSCAPING (CONT.)						
Foundation Planting	4.5.1 to 3	4.5.1 to 3	4.5.1 to 3	4.5.1, 4	4.5.1	4.5.1, 5
Street and Shade Trees	4.6.1 to 4	4.6.1 to 4	4.6.1 to 4	4.6.1 to 4	4.6.1 to 4	4.6.1 to 4
Intersections	4.7.1	4.7.1	4.7.1	4.7.1	4.7.1	4.7.1
Signage Plantings	4.8.1	4.8.1	4.8.1	4.8.1	4.8.1	4.8.1
Screening	4.9.1 to 6	4.9.1 to 6	4.9.1 to 6	4.9.1 to 6	4.9.1 to 6	4.9.1 to 6
Parking Lot Plantings	4.10.1 to 2	4.10.1 to 2	4.10.1 to 2	4.10.1 to 2	4.10.1 to 2	4.10.1 to 2
Pedestrian Control	4.11.1 to 2	4.11.1 to 2	4.11.1 to 2	4.11.1 to 2	4.11.1 to 2	4.11.1 to 2
Outdoor Lounge Areas	NA	NA	4.12.1	NA	NA	NA
Reforestation	4.13.1 to 2	4.13.1 to 2	4.13.1 to 2	4.13.1 to 2	4.13.1 to 2	4.13.1 to 2
Installation	4.14.1 to 9	4.14.1 to 9	4.14.1 to 9	4.14.1 to 9	4.14.1 to 9	4.14.1 to 9
Maintenance	4.15.1 to 6	4.15.1 to 6	4.15.1 to 6	4.15.1 to 6	4.15.1 to 6	4.15.1 to 6
Irrigation	4.16.1 to 2	4.16.1 to 2	4.16.1 to 2	4.16.1 to 2	4.16.1 to 2	4.16.1 to 2
Protection and Clearing	4.17.1 to 10	4.17.1 to 10	4.17.1 to 10	4.17.1 to 10	4.17.1 to 10	4.17.1 to 10
Erosion Control	4.18.1 to 6	4.18.1 to 6	4.18.1 to 6	4.18.1 to 6	4.18.1 to 6	4.18.1 to 6
General Information	5.1.1 to 2	5.1.1 to 2	5.1.1 to 2	5.1.1 to 2	5.1.1 to 2	5.1.1 to 2
Benches	5.2.1 to 2	5.2.1 to 2	5.2.3 to 4	5.2.3 to 4	5.2.3 to 4	5.2.3 to 4
Walls	5.3.1 to 3,5-7	5.3.1 to 3,5-7	5.3.1 to 8	5.3.1 to 8	5.3.1 to 3,5-8	5.3.1 to 8
Fences	5.4.1 to 3,6,7	5.4.1 to 3,6,7	5.4.1 to 3,6,7	5.4.1 to 7	5.4.1 to 3,6,7	5.4.1 to 3,6,7
Game Tables & Seats	5.5.1	5.5.1	5.5.1	5.5.1	5.5.1	5.5.1
Picnic Tables	5.6.1	5.6.1	5.6.1	5.6.1	5.6.1	5.6.1
Shelter/Kiosk System	5.7.1 to 3	5.7.1 to 3	5.7.1 to 3	5.7.1 to 3	5.7.1 to 3	5.7.1 to 3
Drinking Fountains	5.8.1	5.8.1	5.8.1 to 2	5.8.1 to 2	5.8.1 to 2	5.8.1 to 2
Trash Receptacles	5.9.1 to 2	5.9.1 to 2	5.9.1 to 2	5.9.1 to 2	5.9.1 to 2	5.9.1 to 2



## DESIGN GUIDELINE MATRIX

### SITE ELEMENTS

	Admin.	Comm. Facilities	Mission Support	Housing	Open Space	Industrial
Bollards	5.10.1	5.10.1	5.10.1	5.10.1	5.10.1	5.10.1
Lawn Edger	5.11.1	5.11.1	5.11.1	5.11.1	5.11.1	5.11.1
Guardrails	5.12.1	5.12.1	5.12.1	5.12.1	5.12.1	5.12.1
Sign Post Base	5.13.1	5.13.1	5.13.1	5.13.1	5.13.1	5.13.1
Bicycle Racks	5.14.1 to 2	5.14.1 to 2	5.14.1 to 2	5.14.1 to 2	5.14.1 to 2	5.14.1 to 2
Dumpster Enclosures	15.15.1 to 5	5.15.1 to 5	15.15.1 to 5	15.15.1 to 5	15.15.1 to 5	15.15.1 to 5
Mailboxes	NA	NA	NA	5.16.1	NA	NA
Playgrounds	NA	5.17.1 to 2	NA	5.17.1 to 2	5.17.1 to 2	NA
Monuments & Plaques	5.18.1	5.18.1	5.18.1	5.18.1	5.18.1	5.18.1
Flagpoles	5.19.1	5.19.1	5.19.1	5.19.1	5.19.1	5.19.1
Guidon Stands	5.20.1	5.20.1	5.20.1			
<b>SIGNAGE</b>						
General Information	6.1.1 to 5	6.1.1 to 5	6.1.1 to 5	6.1.1 to 5	6.1.1 to 5	6.1.1 to 5
Typeface Symbols	6.2.1 to 6	6.2.1 to 6	6.2.1 to 6	6.2.1 to 6	6.2.1 to 6	6.2.1 to 6
Entry Sign	6.3.2 to 3	6.3.2 to 3	6.3.2 to 3	6.3.2 to 3	6.3.1 to 3	6.3.2 to 3
Headquarters/Area	6.4.1,2,4	6.4.1,2,4	6.4.1,2,4	6.4.1,3,4	6.4.1,2,4	6.4.1,2,4
Prohibitory Warning	6.5.1 to 3	6.5.1 to 3	6.5.1 to 3	6.5.1 to 3	6.5.1 to 3	6.5.1 to 3
Exterior Identification	6.6.1 to 2	6.6.1 to 2	6.6.1 to 2	6.6.1 to 2	6.6.1 to 2	6.6.1 to 2
Centralized Facilities	6.7.1 to 2	6.7.1 to 2	6.7.1 to 2	NA	6.7.1 to 2	6.7.1 to 2
Changeable Message Board	NA	6.8.1 to 2	NA	NA	NA	NA
Facility Entrance	6.9.1 to 4	6.9.1 to 4	6.9.1 to 4	6.9.1 to 4	NA	6.9.1 to 4
Building Numbers	6.10.1	6.10.1	6.10.1	6.10.1	6.10.1	6.10.1
Recreational Facility	NA	6.11.1	NA	6.11.1	6.11.1	NA



# DESIGN GUIDELINE MATRIX

## SITE ELEMENTS

	Admin.	Comm. Facilities	Mission Support	Housing	Open Space	Industrial
<b>SIGNAGE (CONT.)</b>						
Bus Route	NA	6.12.1	6.12.1	6.12.1	NA	NA
Parking/Curb Markings	16.13.1	16.13.1	16.13.1	16.13.1	6.13.1	16.13.1
Exhibit/Information	6.14.1	16.14.1	6.14.1	6.14.1	6.14.1	NA
Street Signs	6.16.1	6.16.1	6.16.1	6.16.1	6.16.1	6.16.1
Temporary Signs	16.17.1 to 3	6.17.1 to 3	16.17.1 to 3	16.17.1 to 3	6.17.1 to 3	6.17.1 to 3
<b>LIGHTING AND UTILITIES</b>						
General Information	7.1.1	7.1.1	7.1.1	7.1.1	7.1.1	7.1.1
Design Objectives	7.2.1	7.2.1	7.2.1	7.2.1	7.2.1	7.2.1
Lighting Types	7.3.1	7.3.1	7.3.1	7.3.1	7.3.1	7.3.1
Street and Parking Lights	7.4.1 to 3	7.4.1 to 3	7.4.1 to 3	7.4.1 to 3	7.4.1 to 3	7.4.1 to 3
Parking Lot and Recreation Lighting	7.5.1	7.5.1	7.5.1	7.5.1	7.5.1	7.5.1
Pedestrian Lights	7.6.1 to 2	7.6.1 to 2	7.6.1 to 2	7.6.1 to 2	7.6.1 to 2	7.6.1 to 2
Fixtures	7.7.1	7.7.1	7.7.1	7.7.1	7.7.1	7.7.1
	7.8.1,5-7	7.8.1,5-7	7.8.1,5-7	7.8.2,5-7	7.8.4 to 7	7.8.3,5-7
Utility Sting	7.9.1 to 5	7.9.1 to 5	7.9.1 to 5	7.9.1 to 5	7.9.1 to 5	7.9.1 to 5
Grates and Inlets	7.10.1 to 2	7.10.1 to 2	7.10.1 to 2	7.10.1 to 2	7.10.1 to 2	7.10.1 to 2
Swales & Channels	7.11.1 to 2	7.11.1 to 2	7.11.1 to 2	7.11.1 to 2	7.11.1 to 2	7.11.1 to 2
Retention Basins	7.12.1	7.12.1	7.12.1	7.12.1	7.12.1	7.12.1
Utility Structures	7.13.1 to 2	7.13.1 to 2	7.13.1 to 2	7.13.1 to 2	7.13.1 to 2	7.13.1 to 2
Traffic Signals	7.14.1 to 2	7.14.1 to 2	7.14.1 to 2	7.14.1 to 2	7.14.1 to 2	7.14.1 to 2
<b>ENVIRONMENTAL CONSIDERATIONS</b>						
General Information	A2.1.1 to 2	A2.1.1 to 2	A2.1.1 to 2	A2.1.1 to 2	(A2.1.1 to 2)	A2.1.1 to 2



# BUILDINGS AND COURTYARDS

## GENERAL INFORMATION

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### General Information

The architectural character intended throughout the Visual District will be a contemporary interpretation of the traditional regional architecture. Brick walls and sloped metal roofs will be key design elements. All buildings, whether new or renovated, must have a consistent architectural character on all sides. All buildings must be very professional and businesslike in appearance as well as being efficient and relatively maintenance free.

The elements that contribute to a buildings' overall architectural character will be presented separately in this section including:

- o massing
- o scale
- o form
- o fenestration

Exterior materials will be discussed in subsequent sections.

Recognizing that buildings sometimes must be adapted to new uses and that some alterations and additions are inevitable, the designs for such adaptations and alterations shall be of high quality and shall respect the distinctive architectural features of the existing building. Inappropriate intrusions should be removed and replaced with more fitting designs. Finally, all maintenance, restoration, additions and modifications shall be positive contributions that preserve and enhance the character of the existing buildings.

Where a building of one particular function is located in a Land Use Zone of a different function, that building must be designed to comply with the design parameters for the zone in which it is located. For example, if an industrial type building is located in the Mission Support area, that building must have the architectural character designated for Mission Support, not Industrial.

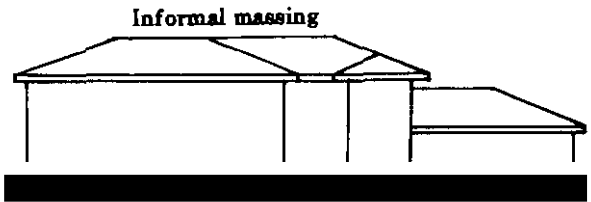
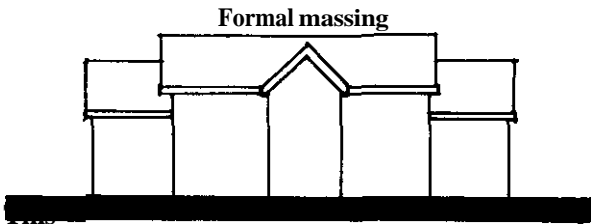
Buildings that are located in areas of the Post that are not usually seen, or that are adjacent to little travelled roads, and those of utilitarian function such as a warehouse that exist in low use areas may be of a reduced design appearance. Utilitarian materials may be considered for most areas of these structures excluding the main entries or areas of administration.



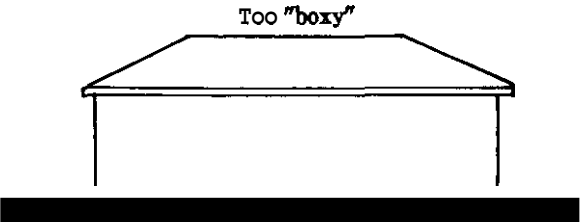


BUILDINGS AND COURTYARDS

GENERAL INFORMATION



This



Not this

Massing

In designing any building for this Post, "break the box", i.e. avoid designs utilizing one rectangular unbroken mass. Major administrative buildings should have a more formal massing than any other building type, signifying their relative importance. This formal massing is achieved through a more balanced or symmetrical design with less articulation. With the exception of a new main headquarters building or hospital, no building shall exceed four stories in height.

Siting

When siting new structures or expanding existing structures, care is to be taken in avoiding construction within wetlands, flood plains, archeological sites and other such sensitive areas. Initial site investigations shall be performed in order to determine the existence of sensitive areas before any construction begins.

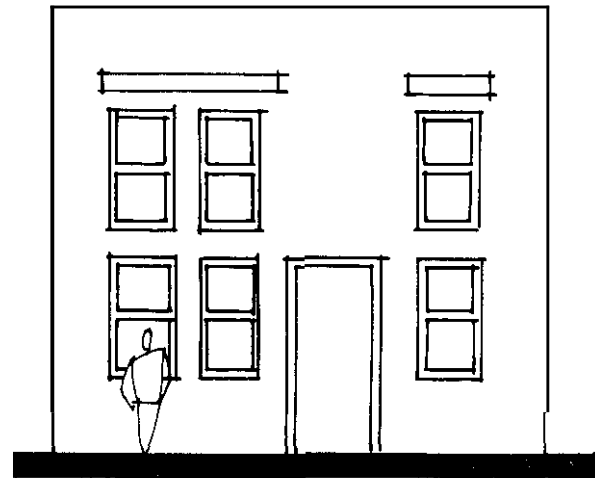


# BUILDINGS AND COURTYARDS

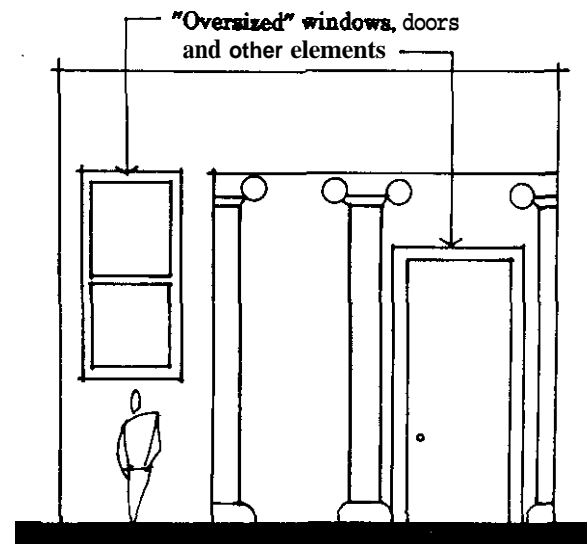
## GENERAL INFORMATION

### Scale

With the exception of major administration buildings, the scale for all buildings will be quite human, not monumental. This human scale is achieved by using small (normal sized) windows, doors, handrails, trim, etc. and also by using normal floor to floor heights and floor to eave heights and an articulation of massing which expresses those heights. For large buildings, human scale is improved to the extent that the mass is broken into smaller elements.



Human scale

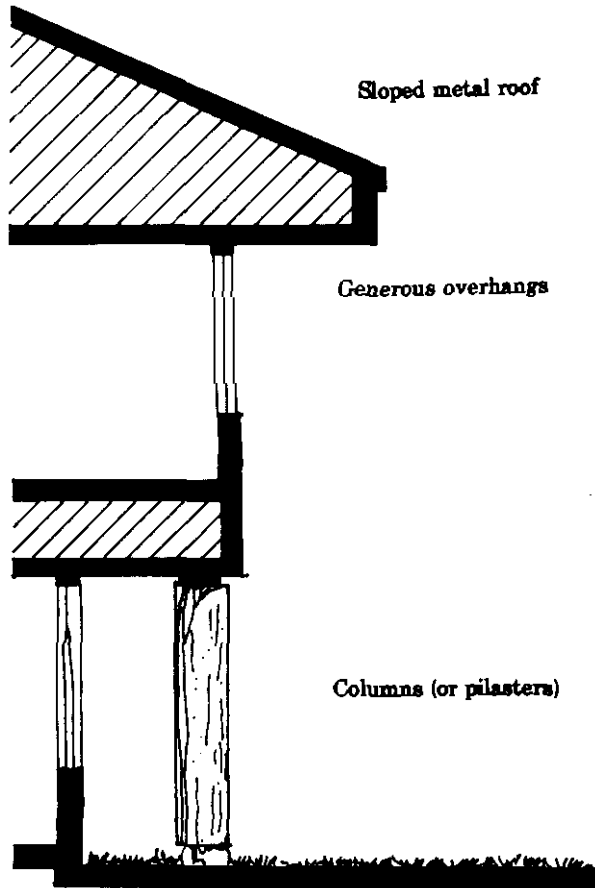


Monumental scale



# BUILDINGS AND COURTYARDS

## GENERAL INFORMATION



Section

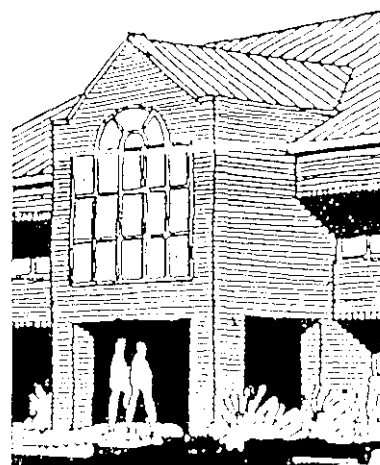
### Form

Forms for all buildings shall be derived from the traditional regional style, but interpreted in a contemporary manner. The most significant form to be used is sloped roofs, either hip, gable or shed, or a combination thereof. Roof pitch shall be moderately steep, similar to the local regional style. "Mansard" roofs are specifically prohibited. Building forms shall also include pilasters or columns (either round or square) with broad overhangs or "porch appearing elements". Overhangs will be used to enhance the overall sculptural effect of the building. See Section 1.6.1 "Climatic Conditions" for additional discussion of overhangs.

Arched forms are acceptable but only as accents. Good examples of arched elements are windows and louvers. In terms of detailing, currently "fashionable" or "trendy" forms, such as Post Modern will be avoided.



This (Contemporary)



Not this (Post Modern)



## BUILDINGS AND COURTYARDS

### GENERAL INFORMATION

---

#### Fenestration

Glazing shall be designed in large areas, not "windows", usually continuous horizontal bands constructed with aluminum storefront. Mullion spacing shall provide a good module for internal layout. Glazing shall be designed to be shaded from the summer sun on the south, east, **and** west sides of each building; however, glass facing west in particular should be minimized. Shading is to be accomplished with either layered bands of recessed wall (inverted "wedding cake") or with sculptural recessed pockets. See Section **1.6.1** for additional information regarding solar shading. Glass block, not necessarily shaded may be used **as** building accents, but only where a clear view from the interior is not required.

All school classrooms, day care rooms, and dwellings or sleeping rooms in any building must be provided with operable windows. In all barracks, multi-family units, duplex units, or single family units for low ranking officers, windows will be aluminum horizontal sliding or single hung. Houses for high ranking officers shall be vinyl or aluminum (exterior) clad wood windows, either casements, single or double hung or combination fixed glass/awning type windows. Muntins will be avoided except at sidelights.

Glass block as entry accent

Horizontal glazing bands  
under generous overhangs



## BUILDINGS AND COURTYARDS

### SITE PLAN TYPES

---

The siting of buildings, the relationship of structure to site and site to structure, a pleasant variety of defined spaces and building relationships provide a more relaxed and welcome environment for living. Fort Jackson's natural features add richness and interest, while the different siting patterns give unique character to a variety of spaces defining the visual districts.

There are five distinct site plan types at Fort Jackson, including:

- community clustered
- repetitious rectangular
- repetitious/irregular
- independent/parallel to road
- topographical orientation

Their purpose is to guide future development, reinforcing the design characteristics recommended for each district.

For the most part, new construction at Fort Jackson will be sited in conformance with existing site plan types.

The five site plan types are described on the following pages specifying characteristics of each type and siting criteria for future development.

All siting efforts shall observe all regulations in regard to existing wetland areas as defined by Section 404 of the Clean Water Act and as outlined on maps maintained by the Master Planning Branch of the Directorate of Engineering and Housing. Specifically, all siting shall avoid wetlands, flood plains, archaeological sites, and endangered species habitats.

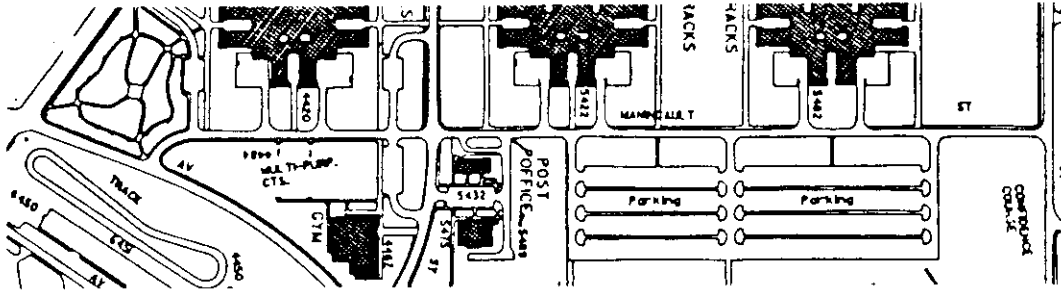


## BUILDINGS AND COURTYARDS

### SITE PLAN TYPES

---

#### Community Clustered



#### Characteristics:

- Defined centers
- Hierarchy of buildings and open space.
- Buildings of varying designs and size according to hierarchy.
- Orientation of buildings vary.
- Setbacks are inconsistent.
- Service access from the rear or sides of the buildings.

#### Siting Criteria:

- This site plan type is to be used in the Community Facilities district and the Mission Support district only.
- Setbacks vary with the building type, but sensitivity should be given to any existing buildings.
- Heights and widths are dependent upon the new building prototypes C and D, page 1.4.2. Existing trees are to be preserved. However, due to the large size of structures typical of this site plan type, the preservation of existing trees is difficult. In such cases, trees on adjacent sites are to be preserved as buffer areas and the new sites replanted.
- Buildings developed in this district must develop some type of order. There must be sensitivity to the spaces between buildings.
- Trees, lighting and site furnishings should be used to establish a sense of relation between buildings.

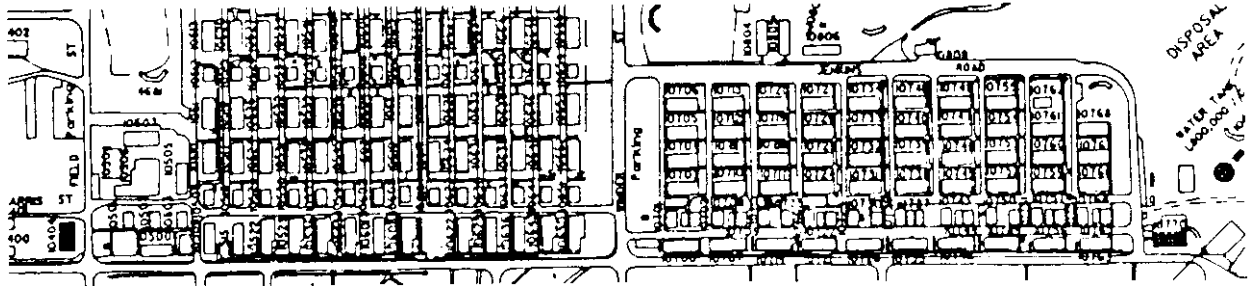


## BUILDINGS AND COURTYARDS

### SITE PLAN TYPES

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#### Repetitious Rectangular

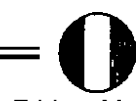


#### Characteristics:

- o No hierarchy of buildings and open space exists.
- o Buildings are uniform in size and height.
- Repetitious placement of rectangular buildings set orthogonal to the road.
- o Buildings have consistent setbacks.
- Buildings are typically older, temporary wooden frame structures that are inefficient and difficult to maintain.

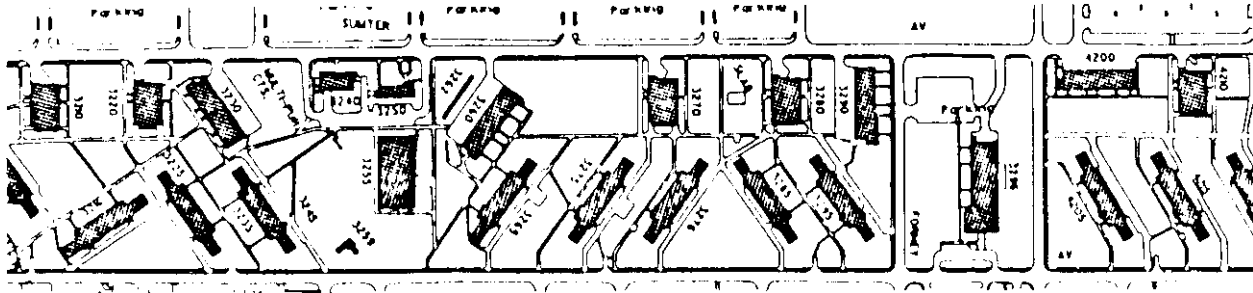
#### Siting Criteria:

- Setbacks should be consistent with existing buildings and oriented in a rectangular arrangement.
- Building heights and widths should not follow existing precedents **as** these areas evolve in their development.
- **The** removal of select structures to open **up** interior, courtyard spaces or forecourts is encouraged.
- Existing trees in these areas are to be preserved through imaginative site planning and protective devices such as retaining walls.



## BUILDINGS AND COURTYARDS SITE PLAN TYPES

### Repetitious Irregular



#### Characteristics:

- No hierarchy of buildings or open space exists.
- Most buildings are uniform in materials, size and heights.
- Buildings are sited irregularly at diagonal to roadways and partially in response to topography.
- Open spaces and walkways are irregular in size and their location, but ample for the area.
- Setbacks vary within a consistent range.
- Buildings are of brick, with flat roofs and are plainly articulated in their windows and entries.

#### Siting Criteria:

- Setbacks may continue to vary within the established range.
- Internal courtyard - lawn areas with community facilities such as dining halls or clinics are encouraged.
- Building heights and widths should follow existing precedents.
- The limited response to topography should continue in all siting efforts.
- Existing trees shall be preserved in all new siting efforts and in all grounds improvement efforts.

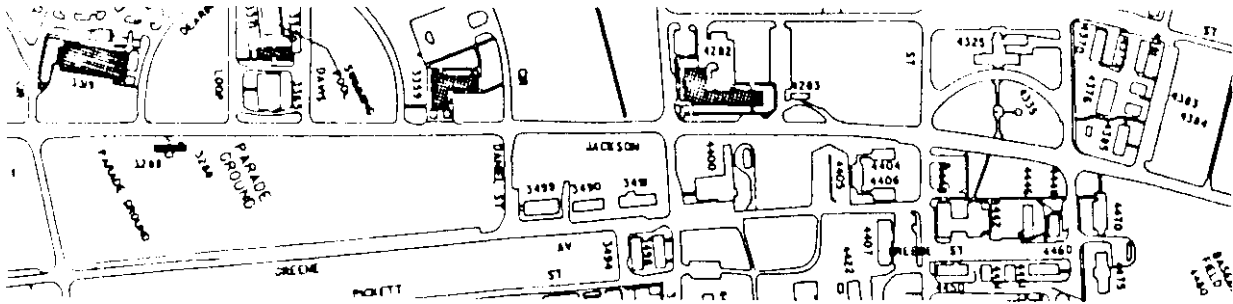


## BUILDINGS AND COURTYARDS

### SITE PLAN TYPES

---

#### Independent/Parallel to Road



#### Characteristics:

- o Defined centers and open space.
- o Hierarchy of buildings and open space.
- o Buildings of different size and height according to hierarchy.
- Buildings are set parallel to the road.
- o Buildings have inconsistent setbacks.
- Some parking occurs along the street.

#### Siting Criteria:

- This site plan type is to be used in administrative, community facilities and mission support districts only.
- Buildings should be sited in a rectilinear arrangement parallel to existing roads.
- o Setbacks will vary, but it is recommended that parking be located behind the building or in lots off the main roads.
- Heights and widths are dependent upon the building prototype and do not have to be dependent on that of older frame structures.
- o Existing trees are to be preserved where possible.
- Any new building sited in an area with an independent/parallel to road type arrangement must develop some kind of order. There must be sensitivity to the spaces between buildings.
- Trees and lighting should be used to establish a sense of unity between buildings.
- Any building located in this site plan type must respect existing permanent structure precedents.

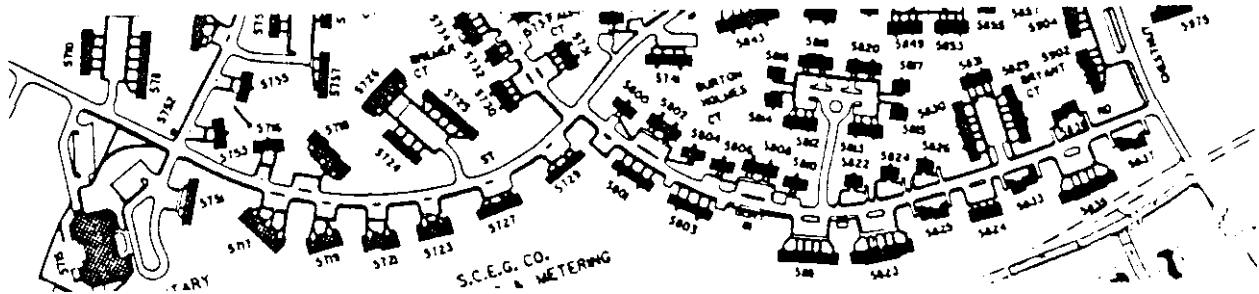


## BUILDINGS AND COURTYARDS

### SITE PLAN TYPES

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#### Topographical Orientation



#### Characteristics:

- o No hierarchy of buildings and open space.
- o Buildings are of relatively uniform size, bulk and height.
- o Buildings are set parallel to curved roads.
- o Buildings have consistent setbacks.
- Buildings and roads respond to natural features of the land.
- Open spaces are located on the periphery.
- o Wooded areas create an edge around the site plan type.

#### Siting Criteria:

- This site plan type is to be used in the housing district only.
- The buildings should be sited to respond to the topography to minimize expansive walls and erosion.
- o Buildings heights and widths should follow existing precedents and building prototypes.
- Existing trees are to be preserved in all development *or* renovation efforts.
- Setbacks vary with the building type. Residences have a greater setback ranging from 25-50 feet. The setbacks for institutional or community service buildings vary from 25-30 feet. The setback should be consistent along the length of the road.
- Any building located in this site plan type must respect existing precedents.



# BUILDINGS AND COURTYARDS

## ARCHITECTURAL CHARACTER

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### General Information

The demands of growth and expanded needs at Fort Jackson are likely to require the construction of additional facilities on Post. The design of any new buildings must respect the established character, positive qualities of architecture and patterns of development found at Fort Jackson. To facilitate this goal, several New Building Prototypes have been derived from the existing building types on Post. Each prototype is intended to enhance the existing built environment and provide a vision for future development at Fort Jackson.

### Architectural Character

Administrative buildings will be formal in their overall character. Major administrative buildings should be somewhat monumental in scale and very formal in their massing, form and fenestration.

Community Facilities buildings will be quite varied in their architectural character depending on the particular building function. Recreational buildings and day care centers should be very playful in character. Entertainment and retail/service facilities should be very informal but not as playful as recreational and day care. Medical facilities and schools shall be more formal than entertainment and retail but still somewhat informal, especially when compared to administrative buildings. High use facilities, such as commissaries, should be very bold in character. Conversely utilitarian type facilities such as laundromats should be very low-key in design.

Mission support facilities will be somewhat informal in their overall architectural character with the exception of headquarters buildings which shall be quite formal, signifying their relative importance.

Housing for single family, duplexes, multi-family and bachelor officers' quarters shall be very informal "residential" in appearance. Housing for high ranking officers may be somewhat more formal than other housing types.

Industrial buildings shall be very informal and somewhat utilitarian in appearance. Industrial buildings shall have the same character as the land use zone they are located in, if other than industrial or the same character as the buildings visible from the street. This sameness shall extend to exterior buildings visible from the street of buildings.

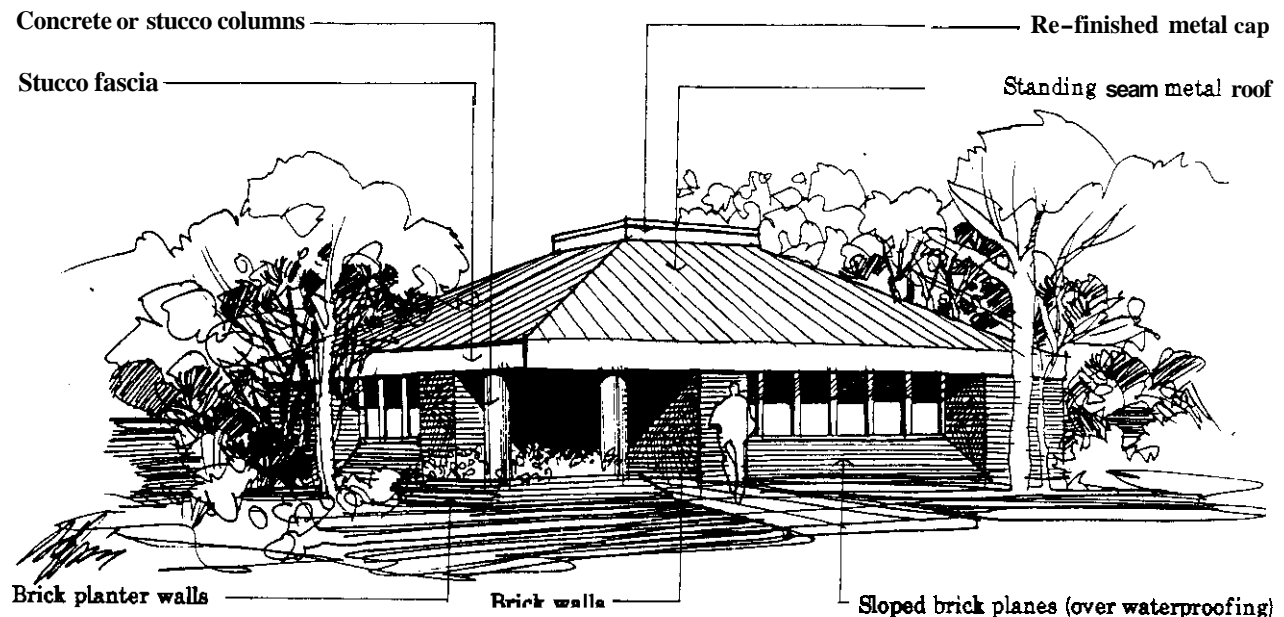


## BUILDINGS AND COURTYARDS

### ARCHITECTURAL CHARACTER

#### Materials

Wall surfaces shall primarily be brick on administrative buildings, community facilities and mission support buildings. Other acceptable wall finishes may be any of the several cementitious material outlined on pages 1.5.2 and 1.5.3, but not more than two such additional materials on any one building. Good uses of these cementitious materials are fascias, columns and wall areas under deep overhangs. Roofs may be standing seam metal or in certain cases fiberglass shingles.. For exact colors to be used refer to page 1.5.2.



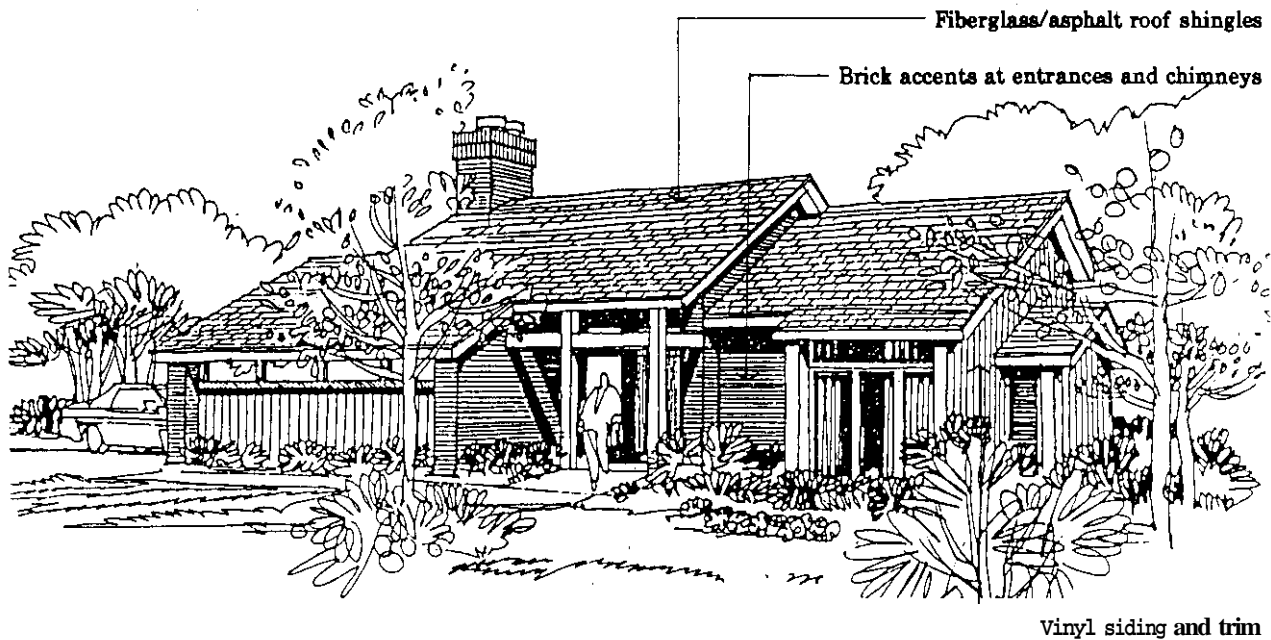
Example of materials for administration buildings, community facilities and mission support buildings

In the housing areas, brick shall be used as a prominent accent material with the exception for high ranking officer's housing which may be all brick. Brick accents are especially important at entrances. The remaining wall areas shall be either stucco (or synthetic stucco), vinyl siding (horizontal, diagonal or vertical). Trim shall be either vinyl or painted wood or prefinished aluminum except that vinyl trim shall always be used with vinyl siding. Roof covering shall be fiberglass asphalt shingles.



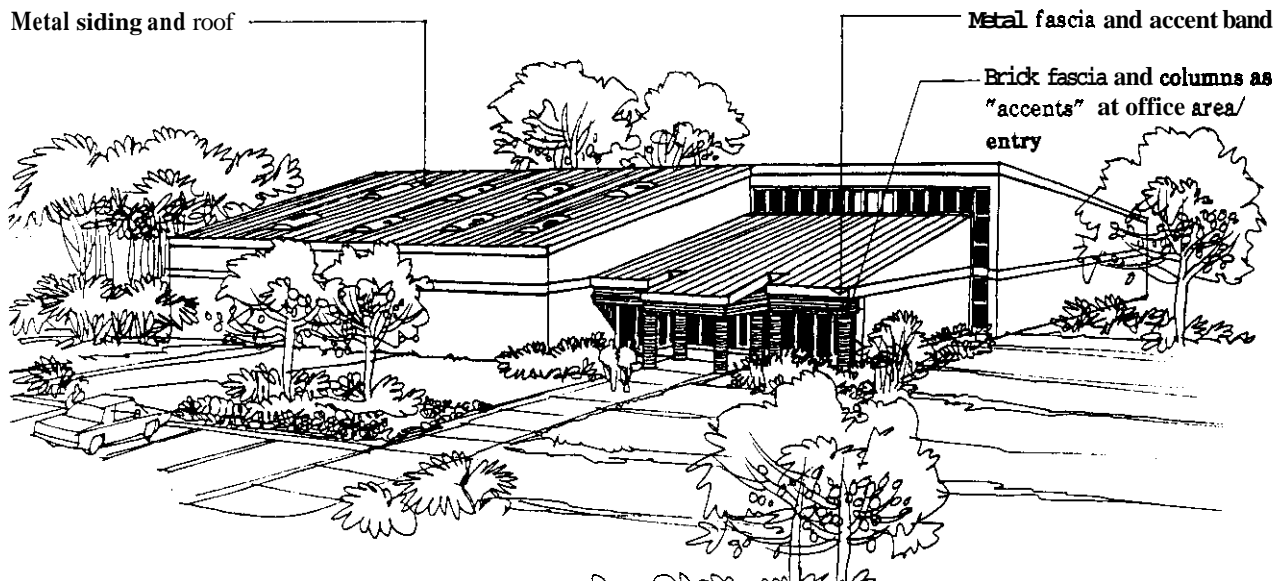
## BUILDINGS AND COURTYARDS

### ARCHITECTURAL CHARACTER



#### Example of materials used in residential areas

For buildings located well within an industrial land use zone or well screened areas, exterior wall materials will be primarily metal siding or concrete (tilt-up or pre-cast). Brick may be used as building accents, especially at entrances. Metal siding may be standing seam configuration or "shaped section except corrugated". Roofing will be standing seam metal. Fascia, trim, etc. will be metal.



#### Example of materials used in industrial areas



# BUILDINGS AND COURTYARDS

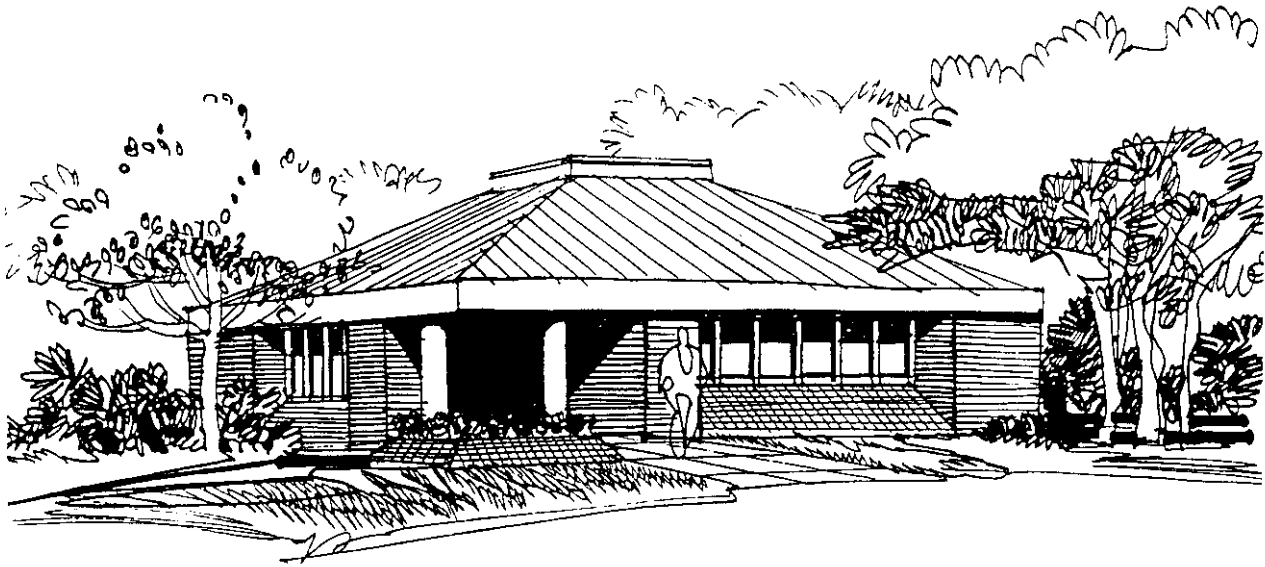
## NEW BUILDING PROTOTYPES

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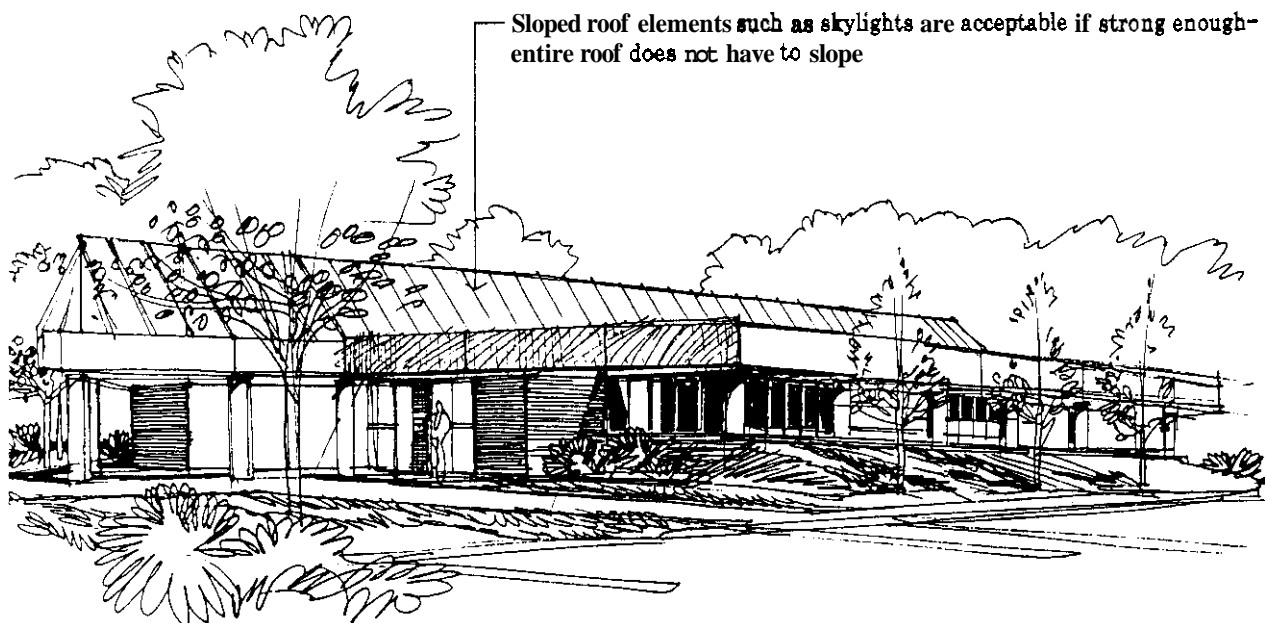
### New Building Prototypes

The following prototypes have been developed as a point of departure for the design development, they should not be interpreted as absolute principles.

#### Prototype A Administration, Community Facilities



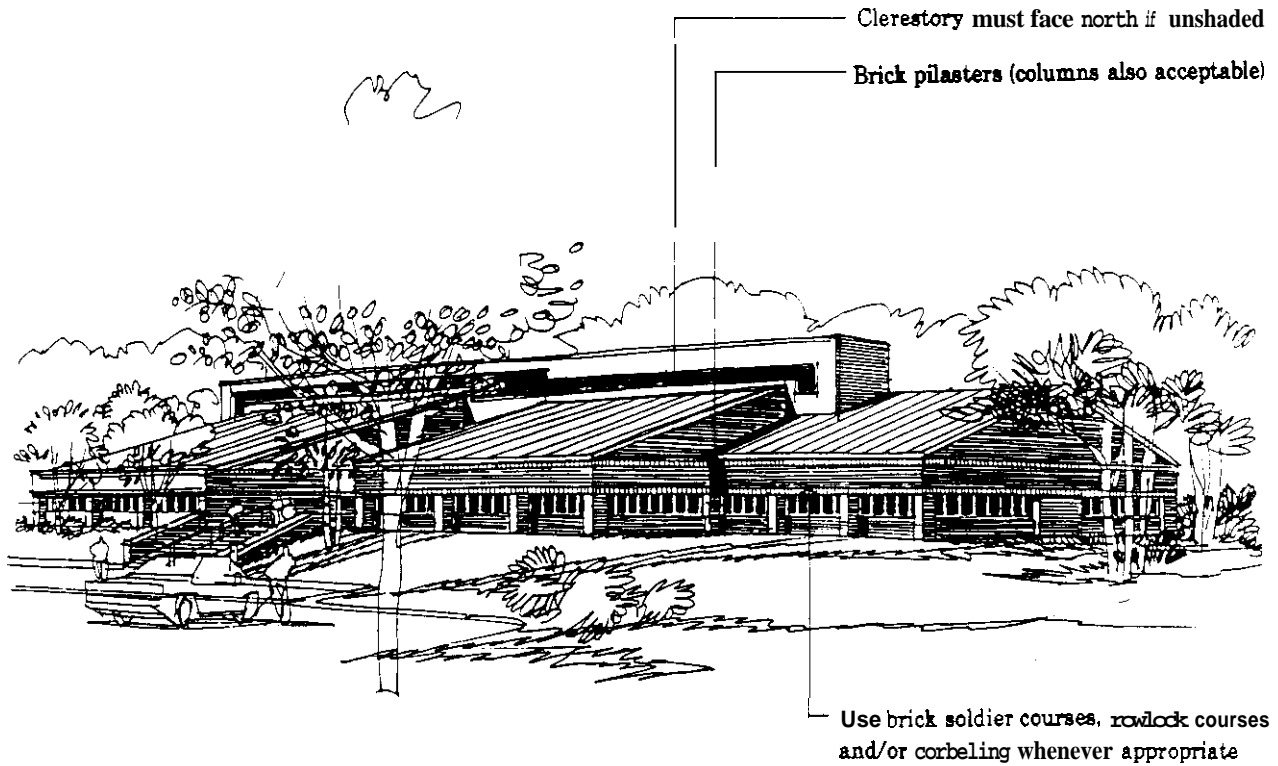
#### Prototype B: Administration, Community Facilities



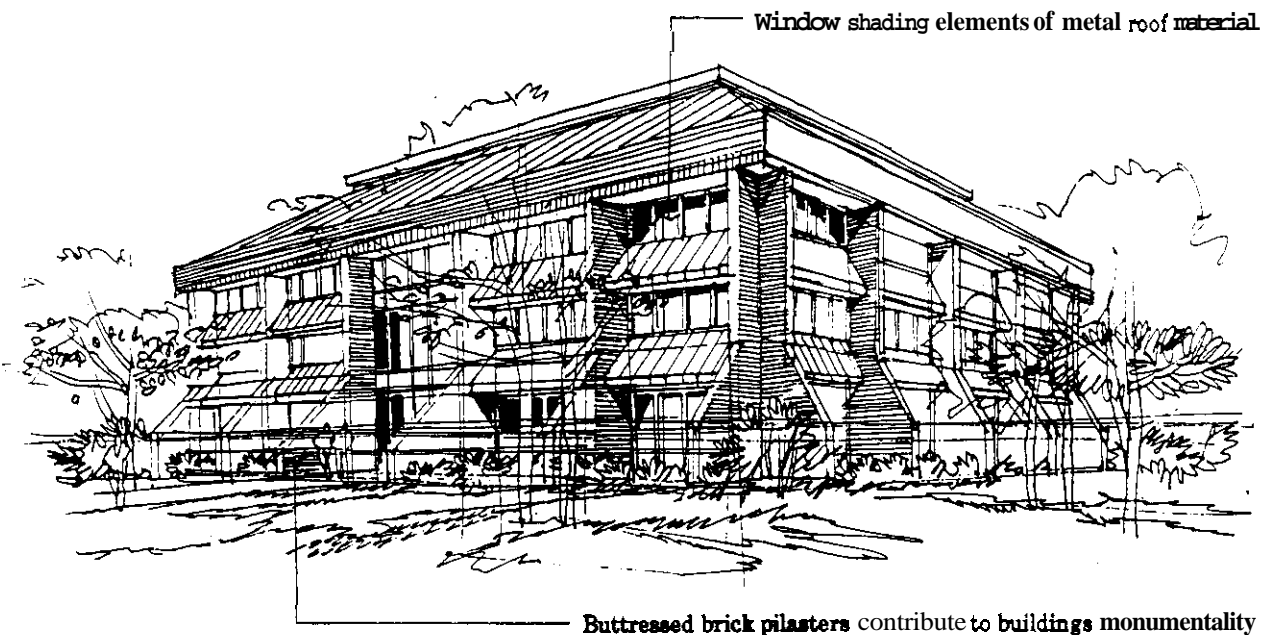
# BUILDINGS AND COURTYARDS

## NEW BUILDING PROTOTYPES

### Prototype C: Administration, Community Facilities, Mission Support



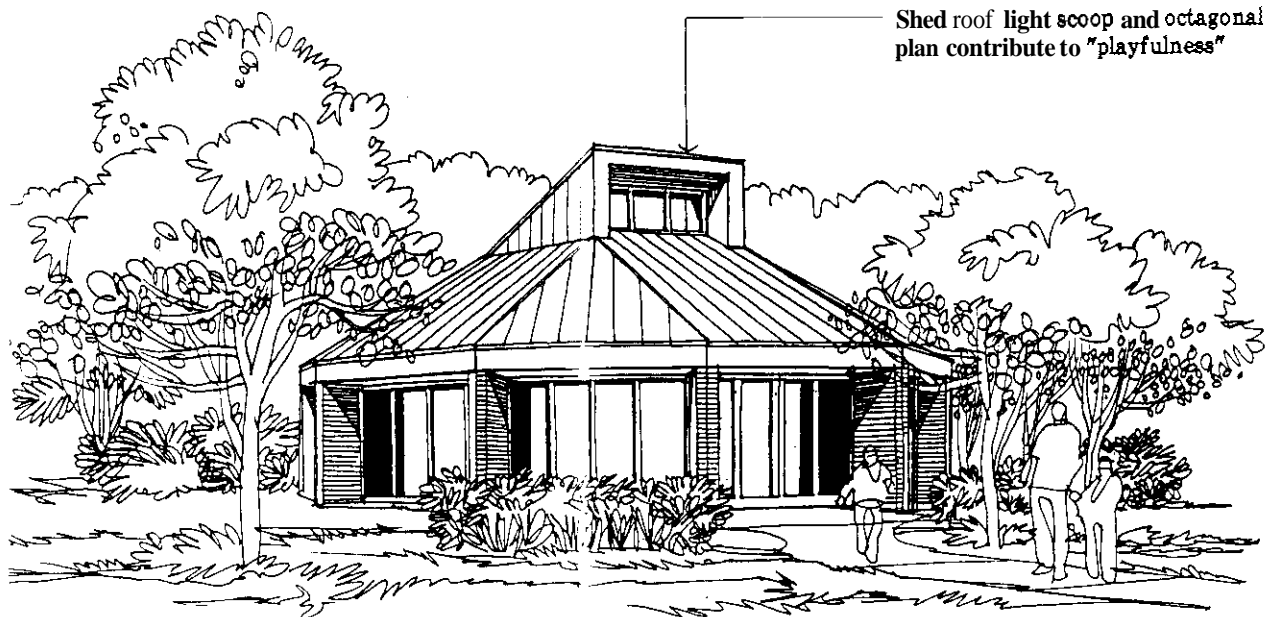
### Prototype D: Administration



## BUILDINGS AND COURTYARDS

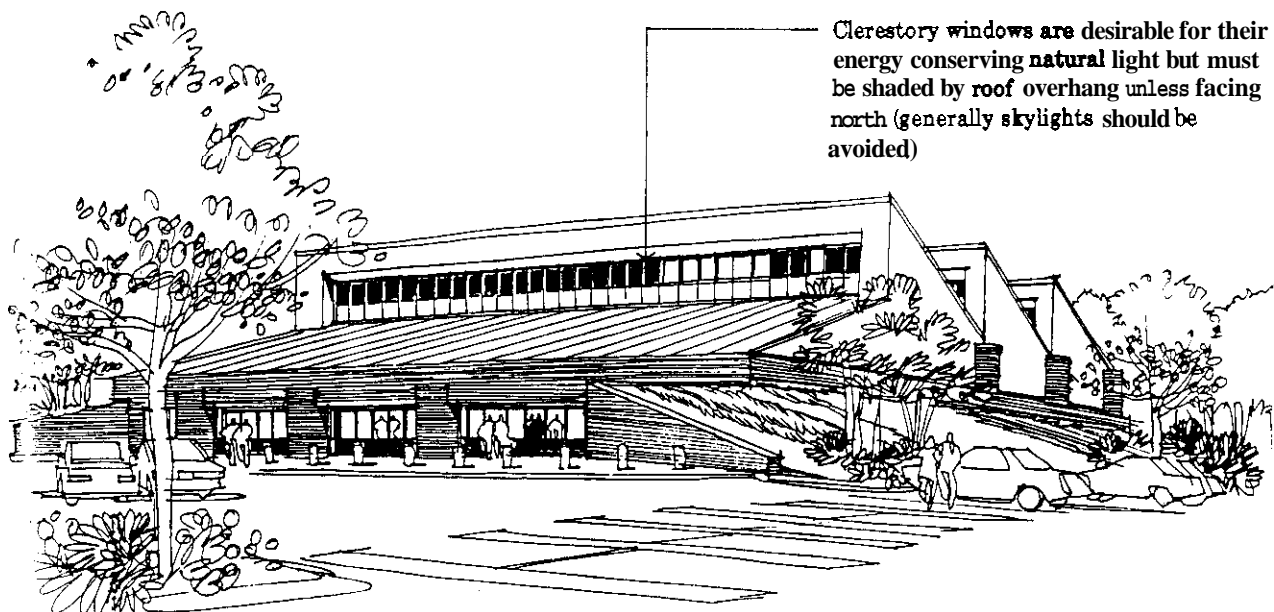
### NEW BUILDING PROTOTYPES

Prototype E: Community Facilities



Prototype F: Community Facilities

**Bold designs such as this are appropriate for high usage buildings such as the Post Exchange or the Commissary-note use of shed roof forms.**



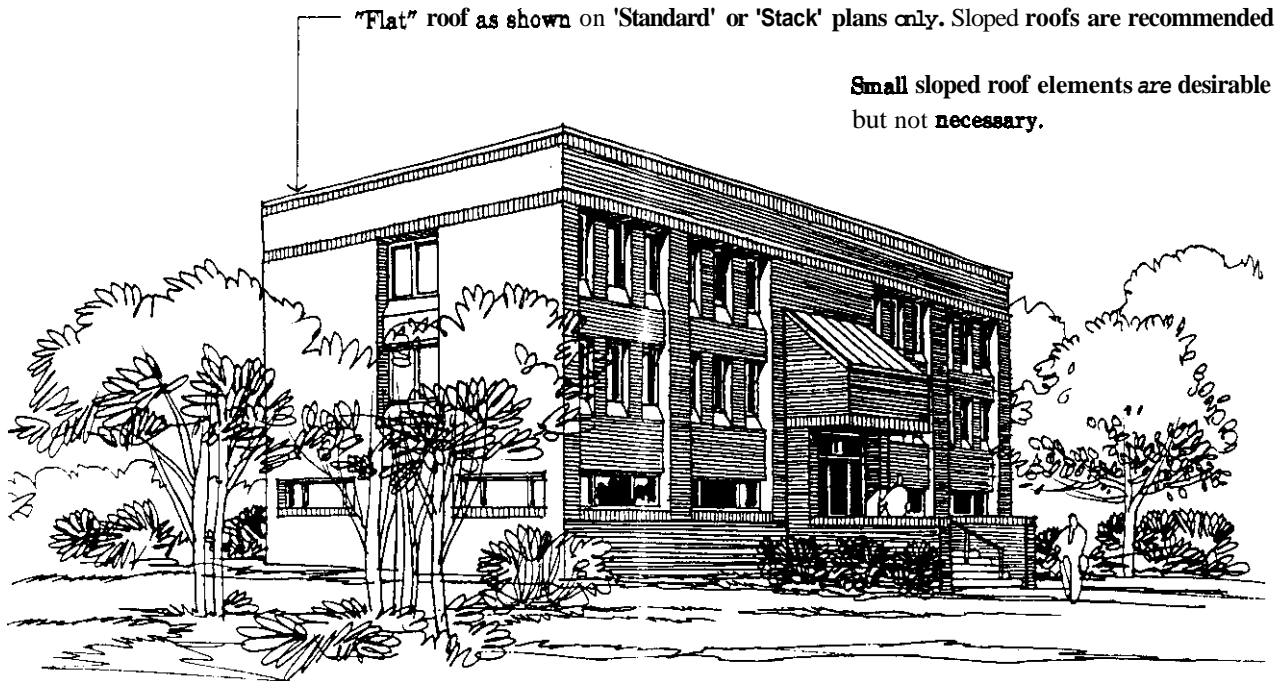


# BUILDINGS AND COURTYARDS

## NEW BUILDING PROTOTYPES

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### Prototype G: Mission Support



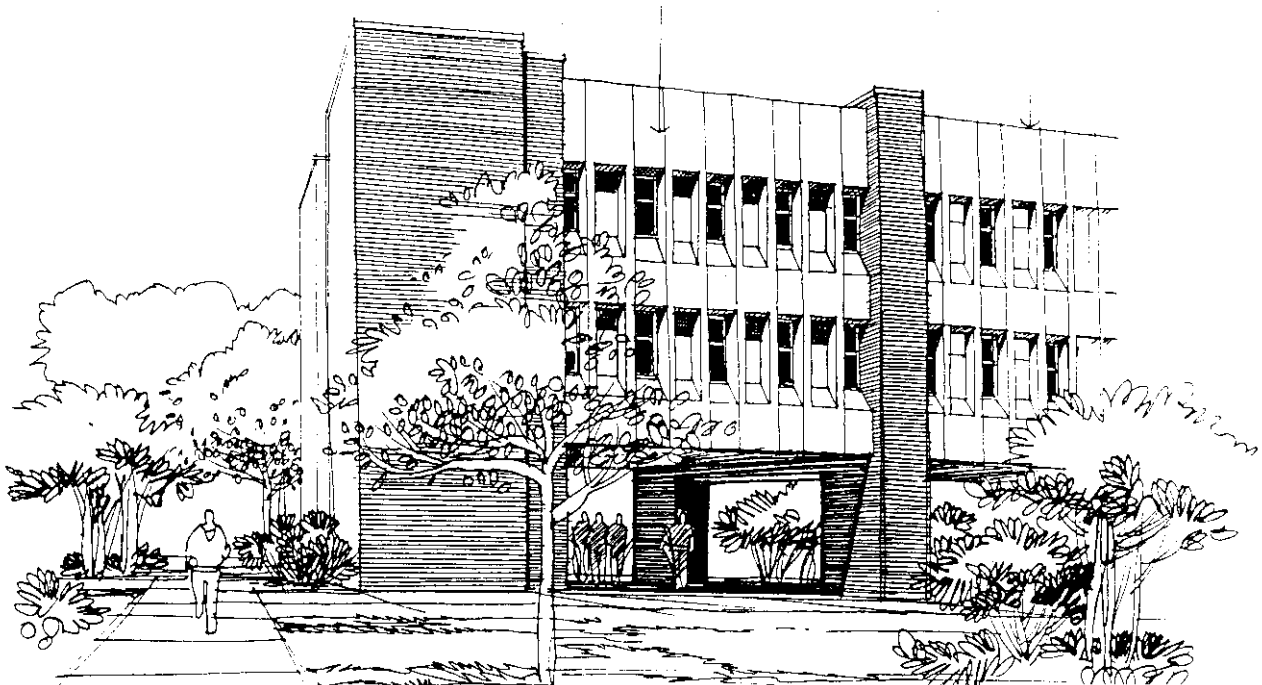
# BUILDINGS AND COURTYARDS

## NEW BUILDING PROTOTYPES

### Prototype H: Mission Support

"Sculptural" pre-cast concrete window elements -

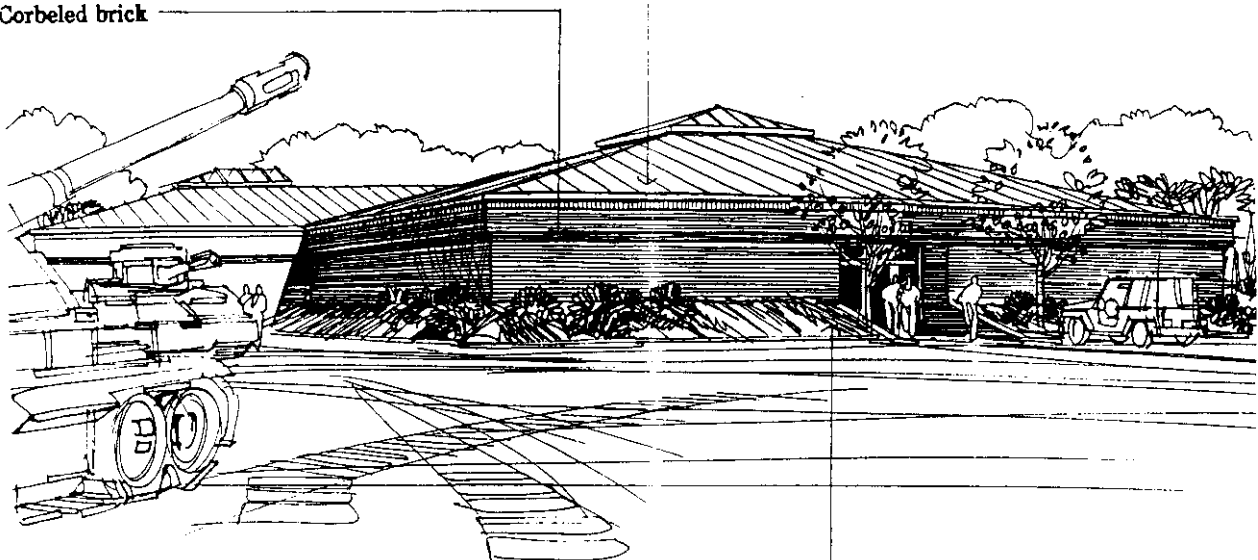
"Flat" roof



### Prototype I: Mission Support

Sloped metal roof (hip roof shown in this example) —————

Corbeled brick —————



Earth berm reduces heat loss/gain

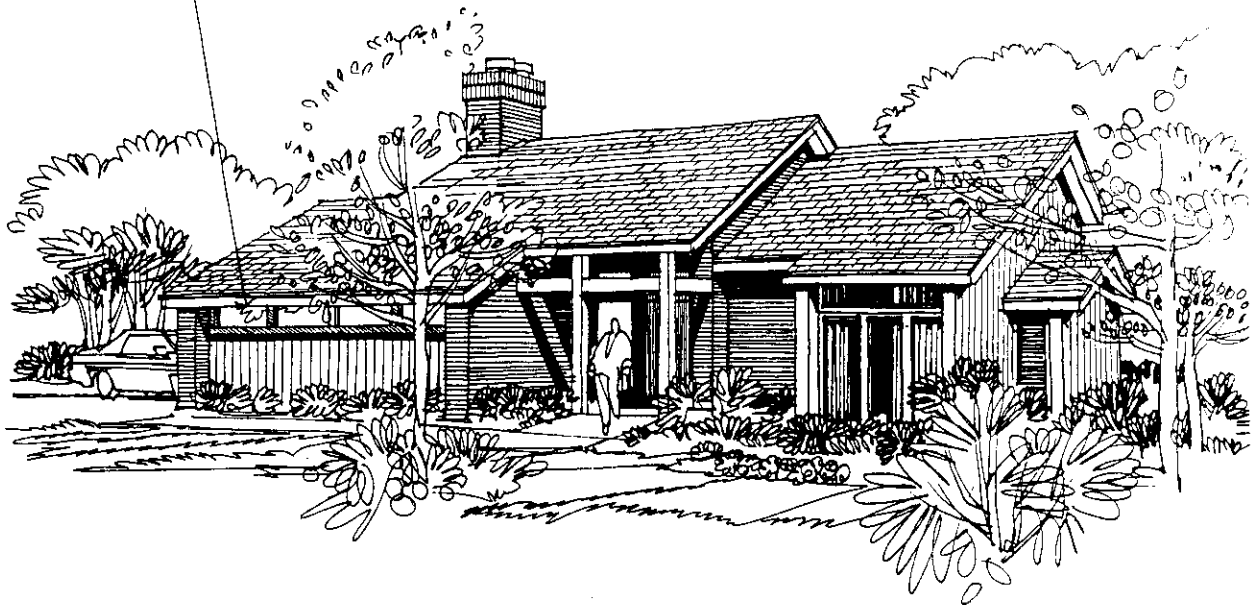


## BUILDINGS AND COURTYARDS

### NEW BUILDING PROTOTYPES

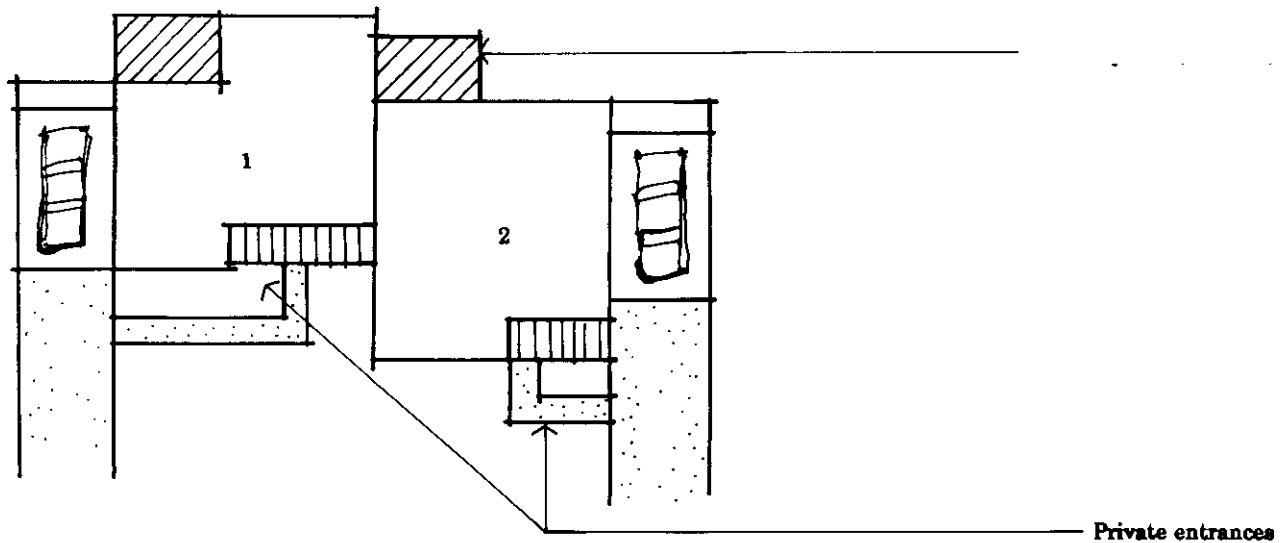
#### Prototype J: Housing

Broad roof overhang to  
shade glazing



**This example is a single family house for a high ranking official.**

#### Duplex Housing



**Provide some unsymmetrical duplexes to break the monotony of typically symmetrical units**



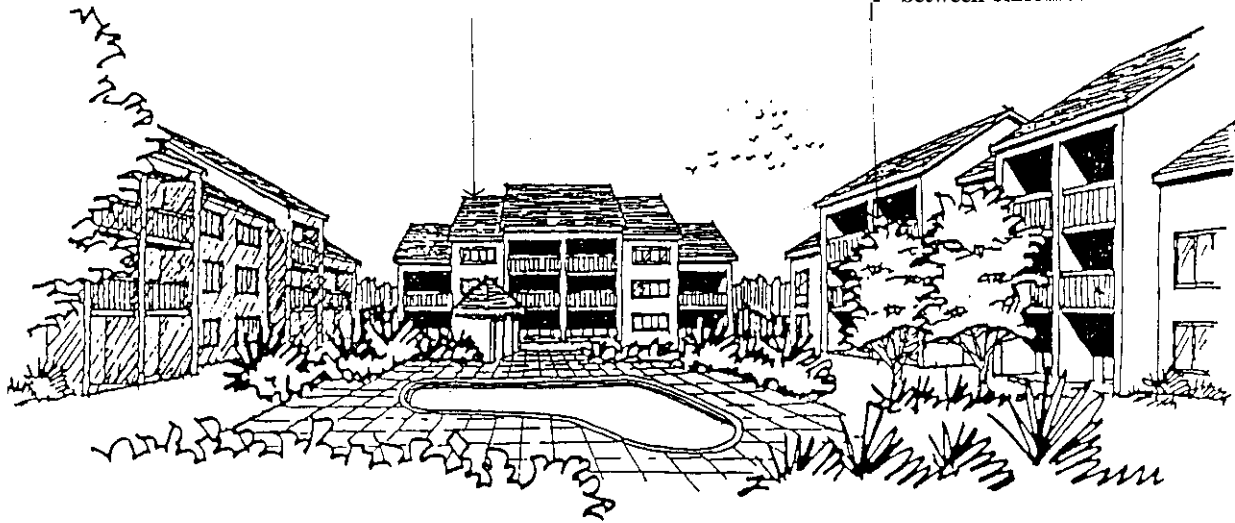
# BUILDINGS AND COURTYARDS

## NEW BUILDING PROTOTYPES

### Prototype K Housing

To reduce apparent massiveness and to improve residential scale, reduce number of stories at end of building and break wall and roof planes

Solid walls for privacy separation between balconies



Multi-family or B.O.Q. Housing



# BUILDINGS AND COURTYARDS

## NEW BUILDING PROTOTYPES

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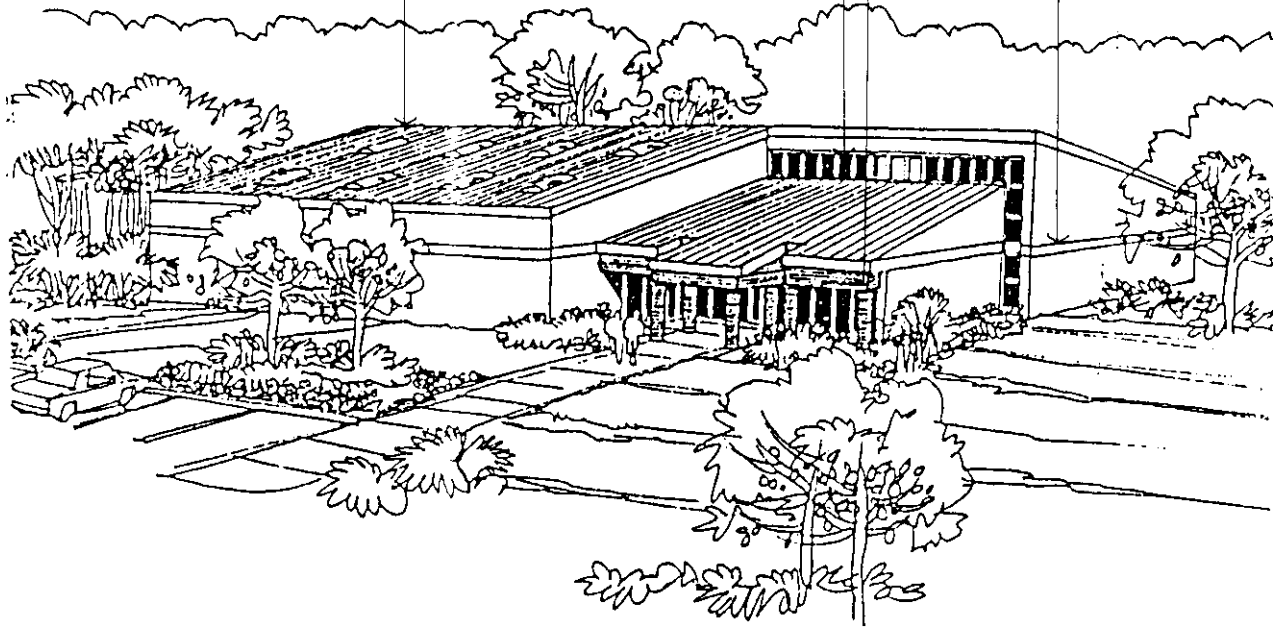
### Prototype L Industrial

Fiberglass roof panels for natural light over storage (Industrial only)

Clerestory over work area

Brick accents at entry

Accent color band



## BUILDINGS AND COURTYARDS

### COLOR AND MATERIALS

---

#### General Information

The purpose of this section is to identify the palette of colors and materials to be used throughout the Post. Specific design criteria for various materials will be discussed in this section. It is not the purpose of this section to discuss the applicability of the various materials for the different land use zones. For the applicability of the various materials refer to the sections discussing "Architectural Character", 1.3.1 thru 1.3.3. Color and Materials will be discussed as relates to various building elements: roofs, walls, columns/pilasters, and trim.

#### Design Objectives

- A unification of design will be achieved by limiting the choices of color and materials, yet the range of choices is sufficient to allow for variety.
- Where colors are listed by a specific manufacturer, other equal materials with identical colors from other manufacturers are acceptable.
- Buildings shall not have more than three basic colors and materials, except for very limited use of a fourth accent color such as a trim band or entry canopy or awning.
- Buildings shall never have more than four basic materials and colors on any one facade, glazing excluded.
- Never change materials and/or colors in the same place unless separated by a deep reveal ( 2 deep by 3 1/2" wide minimum).
- Where selected, accent colors shall be used in very limited quantities. Accent colors shall be used on reveals, trim, window frames, canopies, awnings, etc. The use of accent colors is not required on any building.
- Match surrounding buildings color and materials only if the integrity is acceptable.
- All materials and equipment shall be free of any asbestos or components that contain asbestos particles.
- Lower visibility elements such as industrial buildings are to be painted with dark or receding colors.

#### Master Color Index

A full color Master Index showing all approved building, signage and site furnishings colors may be found in the Appendix of these Guidelines. All colors are taken from the Federal Standard Colors 595B and shall match the samples of that system.



## BUILDINGS AND COURTYARDS

### COLOR AND MATERIALS

MATERIALS	COLORS
<b>Roofs</b>	
Standing Seam Metal	24373/20040
Fiberglass/Asphalt Composition Shingles	Equal in color only to GAF Royal Sovereign Series* Fed. #s with note.
<b>Walls</b> o the term "walls" will include all vertical surfaces including large fascia areas but not including glazing. Walls shall include sharply slanted or corbeled surfaces such as might occur above or below glazing.	
Brick • refer to Brick Colors on page 1.5.3 for general brick color matches currently in use.	
Split-face concrete masonry units	20313/20372/27780
Stucco	20313/20372/27780
Synthetic Stucco	20313/20372/27780
Concrete	20313/20372/27780
Vinyl Siding	23578/26492/25526/27880/20372/23717*
Metal Siding	23522/24373/20040/20152*
Wood Siding	23717/20372*
<b>Columns or Pilasters</b>	
Brick • o refer to Brick Colors on page 1.5.3 for general brick color matches currently in use.	
Split-face CMU's	Color to be integral as manufactured and to be approved by DEH.
stucco	20313/20372/27780
Synthetic Stucco	20313/20372/27780
Concrete	20313/20372/27780
Metal Squared Tubing	20313/20372/27780/20040
<b>Trim</b> o trim shall include such items as fascias, corner trim, door and window trim and in some cases flashing. Trim materials are listed in order of priority, based on long term disability.	
Vinyl	20372/23717
Aluminum	20059/23717/20372/21136* (accent only)
Painted Wood	20372/20059/23717/21136* (accent only)
Canvas Awnings & Canopies	23655/25180/24108/20061

\*Manufacturer color to match Federal #'s as close as possible and address on case by case by DEH.



## BUILDINGS AND COURTYARDS

### COLOR AND MATERIALS

Brick selection for new facilities design shall match the color and style of brick used in the nearest adjacent building(s). In cases where two or more styles are present, the DEH shall make the final brick selection. Existing brick now in use for selected buildings include the following:

LOCATION	COLOR
Miles Simulation Labs	Medium brown, flashed wirecut
Training & Audio Visual Support Center	Match Ashe Hatteras
369th A.G. Headquarters	Rangy, Tan, Red, Brown flashed
Personnel School	Tan Wirecut
1699 Washington Road	Match - Merry 3-504
L. Mendall Rivers Reception	Delta 5105 Jumbo Utility French Grey
Pump Stations	Match - Ashe Driftwood
4th BN 13th Infantry Forest Drive at Iverson Road	Match - Merry Augusta Blend
Headquarters 1st Battalion 5482 Jackson Blvd	Match - Merry Augusta Blend
2nd Training Brigade Headquarters 5385 Jackson Blvd	Match - Merry Augusta Blend Queen Size
Barker Bld 4394 Imboden Arts & Crafts	2" x 11 <del>W</del> Match-Delta Doeskin
Theatre 2,4392 Imboden	Match - Merry Medium Brown
Oliver Dental clinic 4323 Hill Street	Sand finished flashed red, brown range
4333 Hill Street	Sand finished flashed red, brown range
Building 4255 Hill Street	Sand finished flashed red, brown range
Building 4243 Hill Street	Sand finished flashed red, brown range
Perez Fitness Center Sumter Avenue	Pink, brown, tan range
Building 3250 and 3255	Pink, brown, tan range
Building 2179 Sumter Avenue at Beauregard Lt. Wt. Vehicle Mechanic Course	Match - Merry 10-824
Building 2119 - Sumter Avenue	Match #10-824 Merry Pink Wuecut
Building 2200	Match - Burns 328
Building 2300	Match - #10-824 Pink Wuecut
Building 1699 Washington & Lee Road	Match - Velvetex Brown Range
277th QM BN US Army Unit Supply	Match - 10-852 Tan Wuecut
Soldier Service Center	Richtex #605; modular
AAFES Branch PX/Gas Disp.	Burns Flashed 104 Georgia Maid (20%) & Burns Flashed F158 Georgian.
Consolidated Field Maintenance Complex	Merry Bros. Flashed 10-835 Dark Gray Wirecut





## BUILDINGS AND COURTYARDS

### COLOR AND MATERIALS

LOCATION	COLOR
10th Trans. Vehicle Maintenance Shoo	Merrv Bros. 10-933 Light Gray Wirecut

**Notes:**

1. If the called out brick is not available, match colors as closely as possible.
2. C.M.U's, brick or precast units shall be asbestos free.



## BUILDINGS AND COURTYARDS

### CLIMATIC CONDITIONS

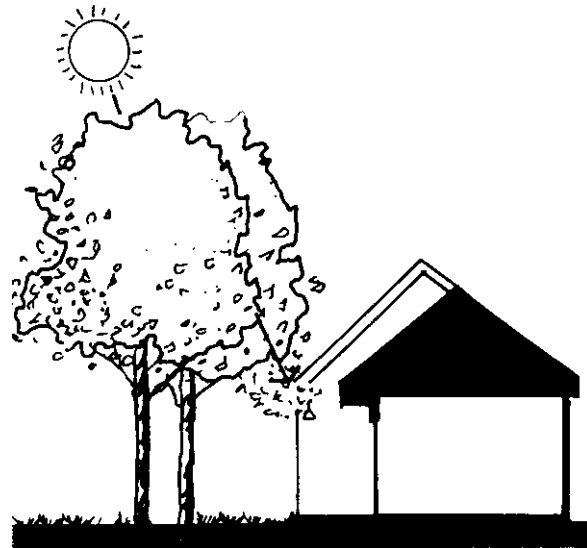
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#### General Information

The climate for this Post can be described as hot and humid in the summer and cool to cold in the winter. Building and site design should respond to this climate in order to conserve energy in the operation of **HVAC** systems and also to give buildings a look indigenous to the region while at the same time having a unifying effect on the Post. Several design elements should be incorporated into each building design to accommodate the climate.

#### Solar Gain and Shading

The most important consideration for building design in this climate zone is controlling the relationship between glazed areas and sunshine in order to let the sunshine in during the winter but block it out during the summer. The first priority for doing this is to insure that glazing is in the shade of deciduous trees or vines on the south, east and west sides of the building.



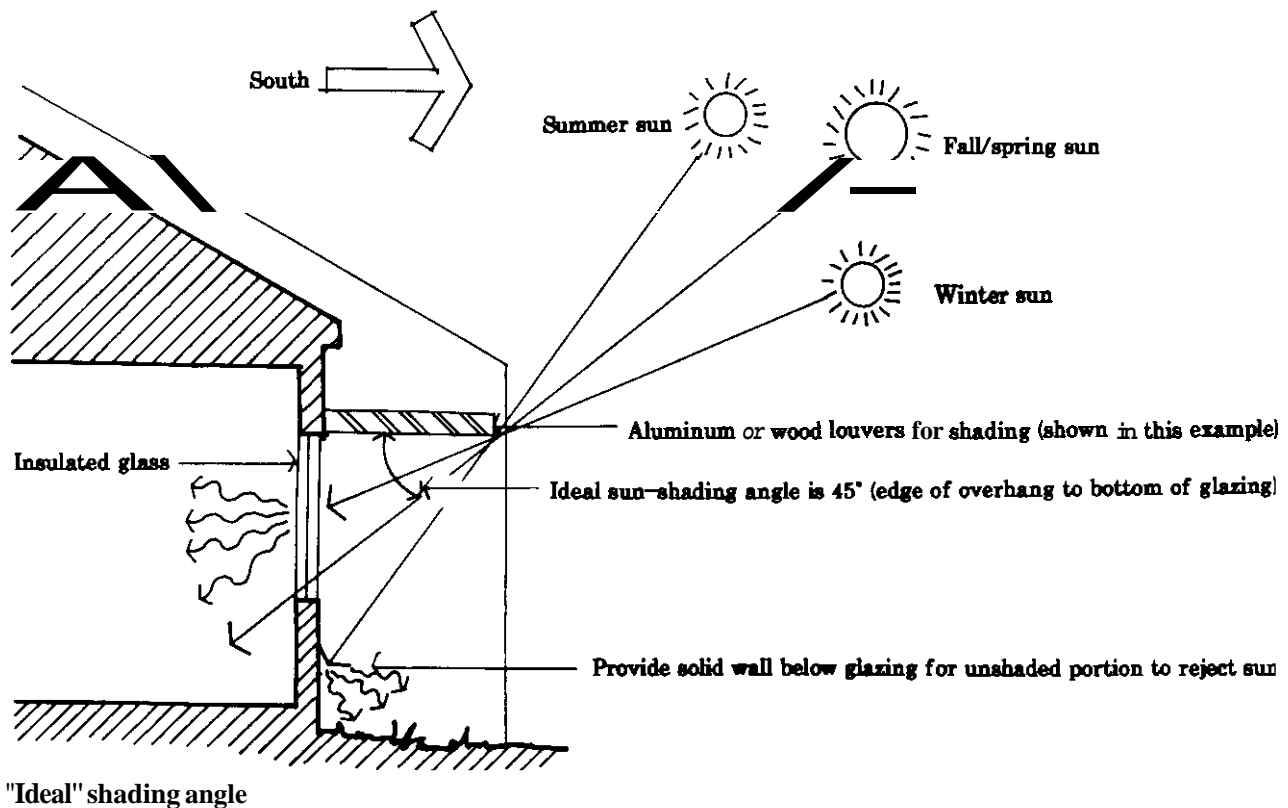
Deciduous trees and vines



# BUILDINGS AND COURTYARDS

## CLIMATIC CONDITIONS

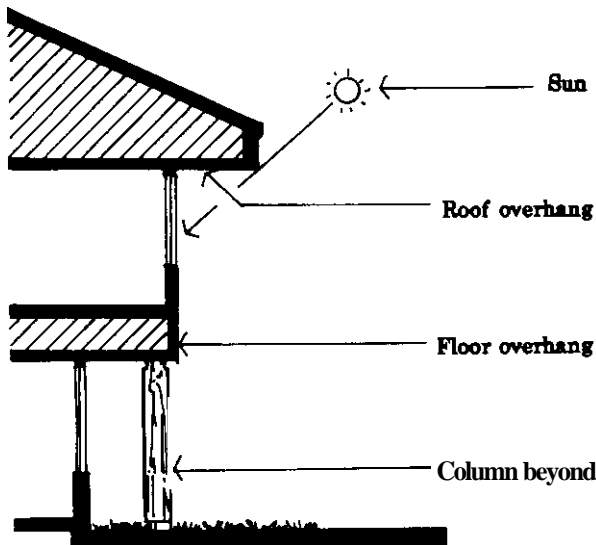
Where deciduous trees are not available for shading, manmade elements such as roof overhangs, floor overhangs, porches, trellises, exterior louvers and other similar elements must be provided to shade exterior walls and glazed areas. Flat concrete "eyebrow" projections and aluminum or fabric awnings or canopies must be avoided.



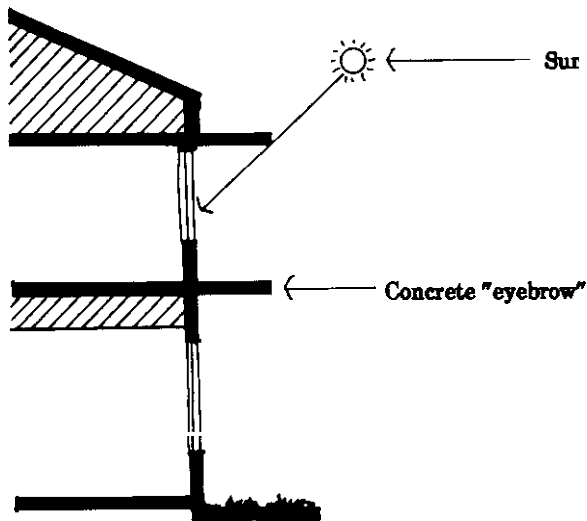
BUILDINGS AND COURTYARDS

CLIMATIC CONDITIONS

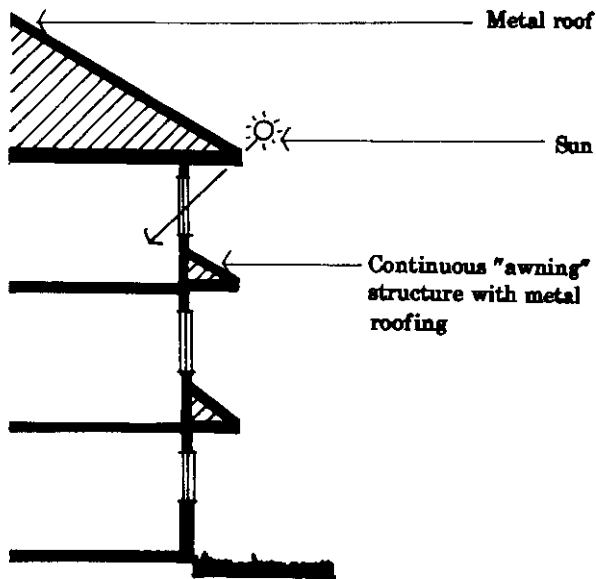
Solar Gain and Shading



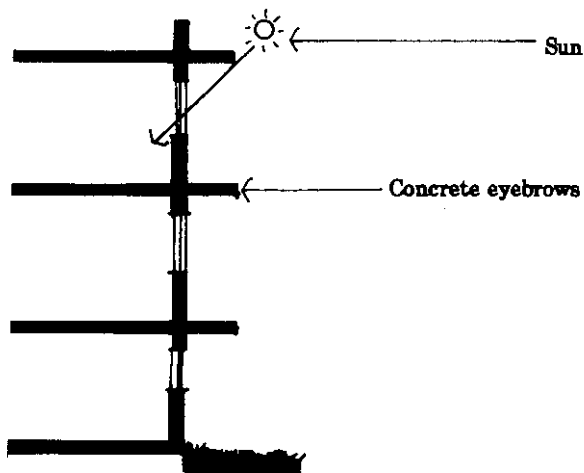
This



Not this



This



Not this



## BUILDINGS AND COURTYARDS

### CLIMATIC CONDITIONS

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#### Solar Gain and Shading

Use "sculptural" brick recesses as shading elements

Canopies will provide rain protection while shaping entries

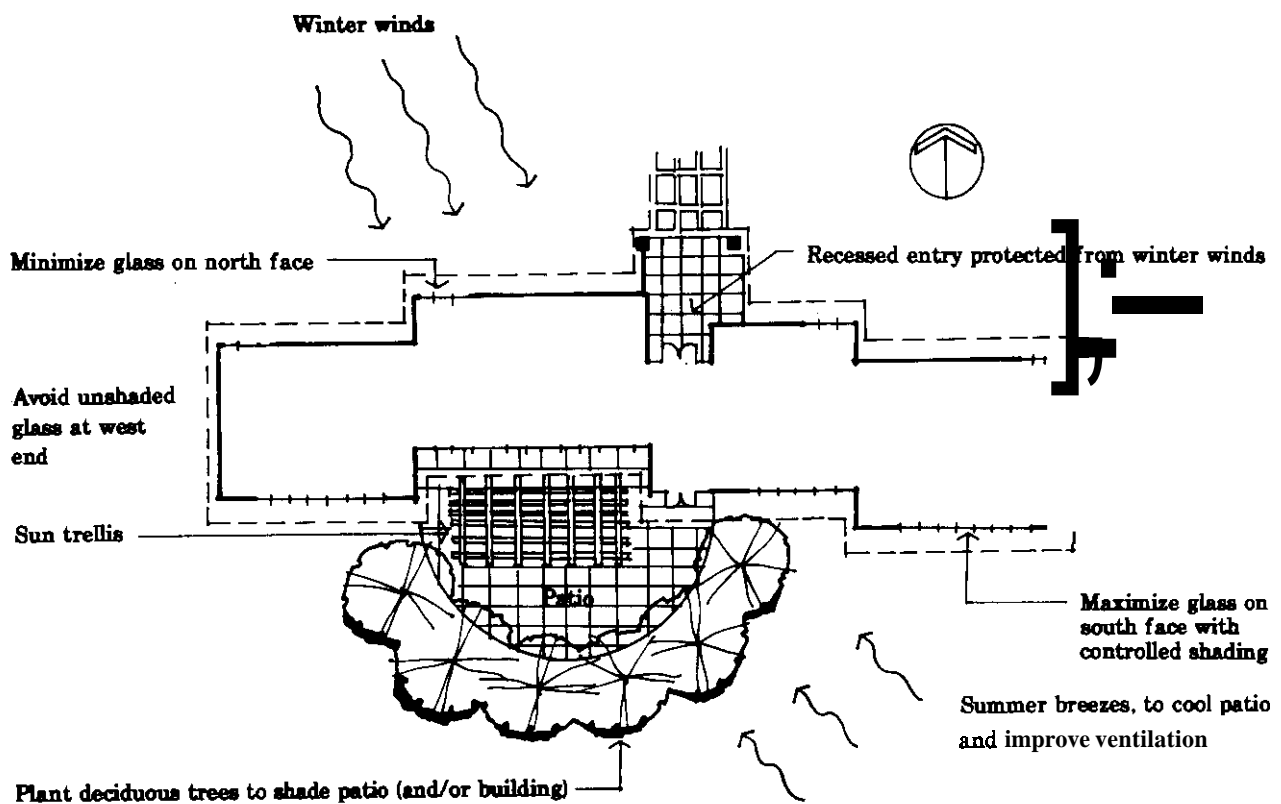


## BUILDINGS AND COURTYARDS

### CLIMATIC CONDITIONS

#### Orientation

Outdoor spaces, doors and operable windows (where used) shall be oriented to avoid winter winds and take advantage of summer breezes. Avoid large glazed areas facing west or southwest unless shaded by deciduous trees, very wide overhangs, exterior louvers or some similar shading device. Orient the long building dimension east and west where possible and use controlled overhangs or other shading devices to let in winter sun while rejecting summer sun.



# BUILDINGS AND COURTYARDS

## CLIMATIC CONDITIONS

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### Passive Solar Applications

The use of passive solar heating and insulating techniques can not only save the Army energy, but provide more comfortable spaces in which to live, work and train. There are a number of simple, traditional methods that have fallen out of use due to the rise of inexpensive fuels in recent times. These methods should be re-examined and applied in the design of all new structures, additions and renovation efforts on Post. The following is a list of techniques that are to be considered in all such efforts:

- **Glazing** - Reduce the area of south and west facing glazing while increasing that of the north and east facing windows. All glazing should have interior shading devices that also possess some insulating or air trapping capacity to hold gained solar heat during the evenings and nights.
- **Shading** - South facing glazing may be recessed into facades or fitted with an overhang or eaves that will shade the window from 10:00am through 5:00pm during the summer months (approximately 3 feet). This overhang or eave should also be used on the west side of the structure.
- **Materials** - Double pane glazing is to be used in all new construction and most windows are to be operable. The use of masonry wall systems is encouraged with increased wall thicknesses being used on south and west facades. All mullions and fenestration elements are to be non conducting, two member systems.
- **Earth Berming** - The use of earth berming of exterior wall surfaces is recommended. The sandy clay soils of the region are well suited for this technique and several good examples, such as the Commissary are present on Post.
- **Floor Layout** - The design of internal space layouts should take into account the intense solar heat gain common to the region in the summer months. Daytime work and use areas should not be located immediately adjacent to west or south facing walls when possible.

These passive solar applications are not a definitive list and are not intended to exclude other established or newer innovative techniques. All such applications are encouraged.

### Active Solar Applications

Available technology is encouraged and should be utilized on a case by case basis.



## BUILDINGS AND COURTYARDS

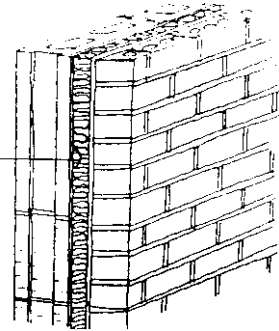
### CLIMATIC CONDITIONS

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#### Thermal Mass

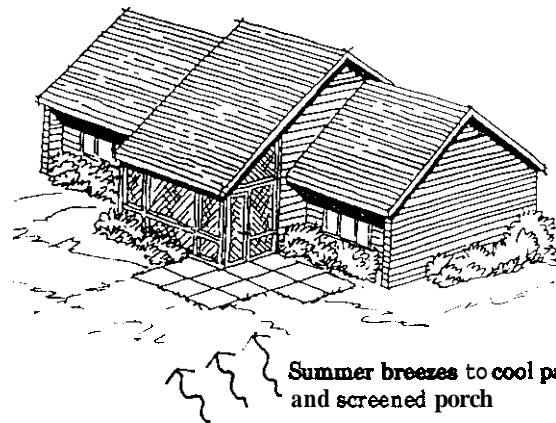
Use massive construction materials such as brick along with continuous exterior insulation for the most effective time-lag heating, flattening day-to-night temperature swings.

Rigid insulation with air cavity between C.M.U. and brick veneer



#### Outdoor Living Areas

Provide outdoor covered living areas such as porches, screened porches or decks/patios with trellises over, to insure a shady and cool living area. Such spaces shall be oriented to take advantage of summer breezes.



Summer breezes to cool patio and screened porch





## BUILDINGS AND COURTYARDS

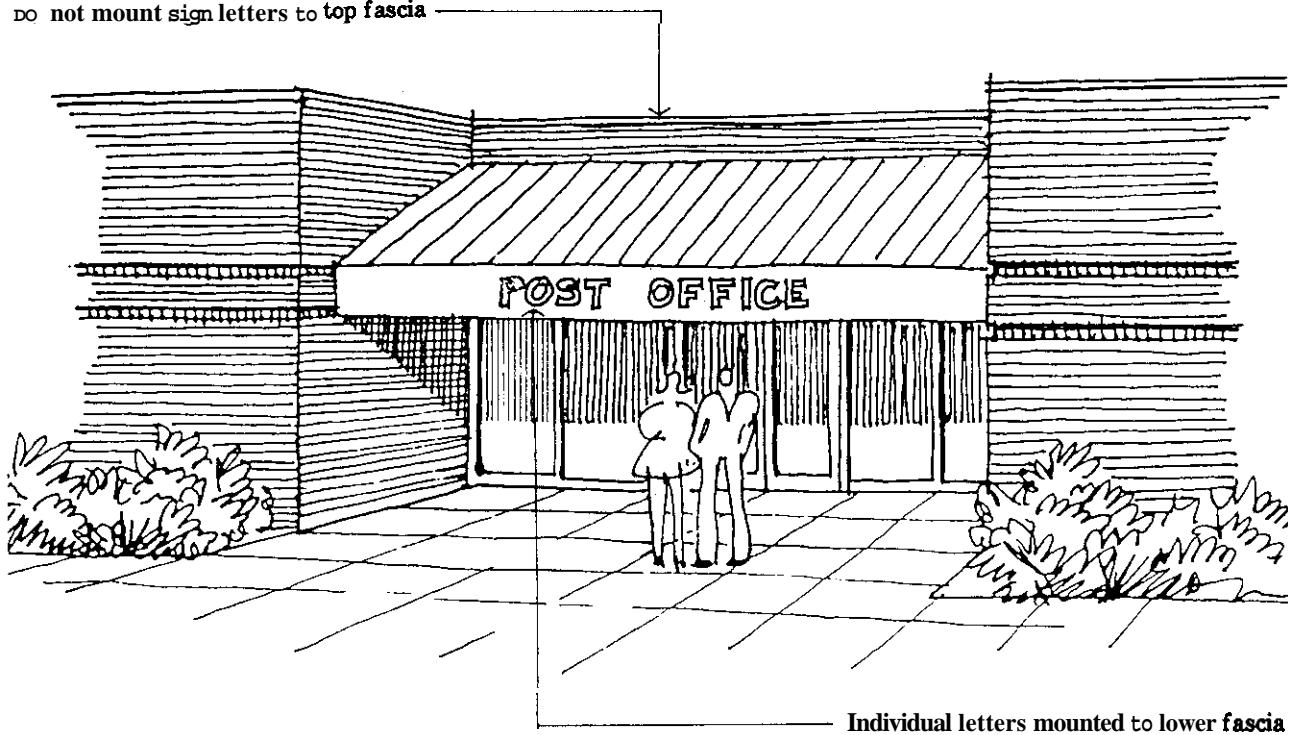
### BUILDING SIGNAGE

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#### General Information

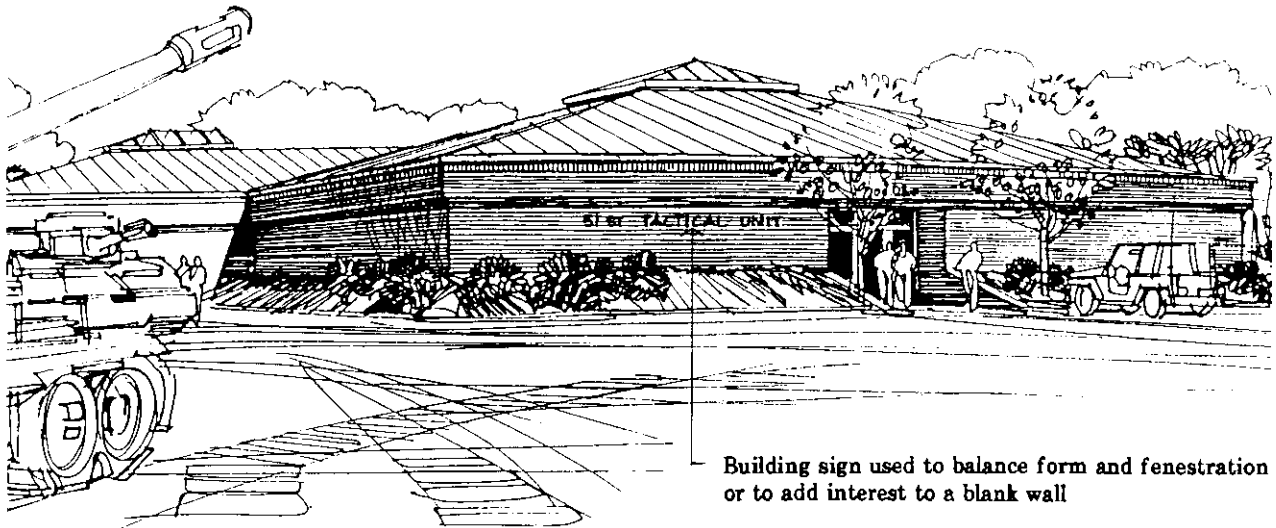
Building identification shall be accomplished through a series of coordinated, well designed signs located in landscaped areas. Signs mounted to buildings should typically be avoided. For certain high use Administrative or Community Facility buildings, it may be appropriate to use building mounted signage, if done **as** indicated herein. Ideally, such signage shall add architectural interest and should help identify main building entries. Signs for Retail buildings must be coordinated with AAFES standards.

DO not mount sign letters to top fascia



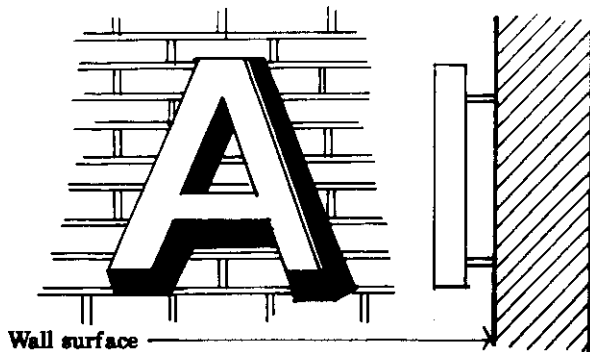
## BUILDINGS AND COURTYARDS

### BUILDING SIGNAGE



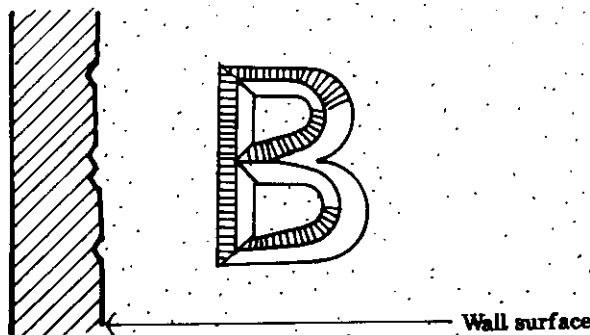
Building sign used to balance form and fenestration or to add interest to a blank wall

Building sign used to balance form and fenestration or to add interest to a blank wall



Sign letter shall be pin-mounted aluminum with baked enamel or anodized finish. Where nighttime identification is important, letters may be backlit. Lettering style shall be helvetica medium or helvetica regular.

or



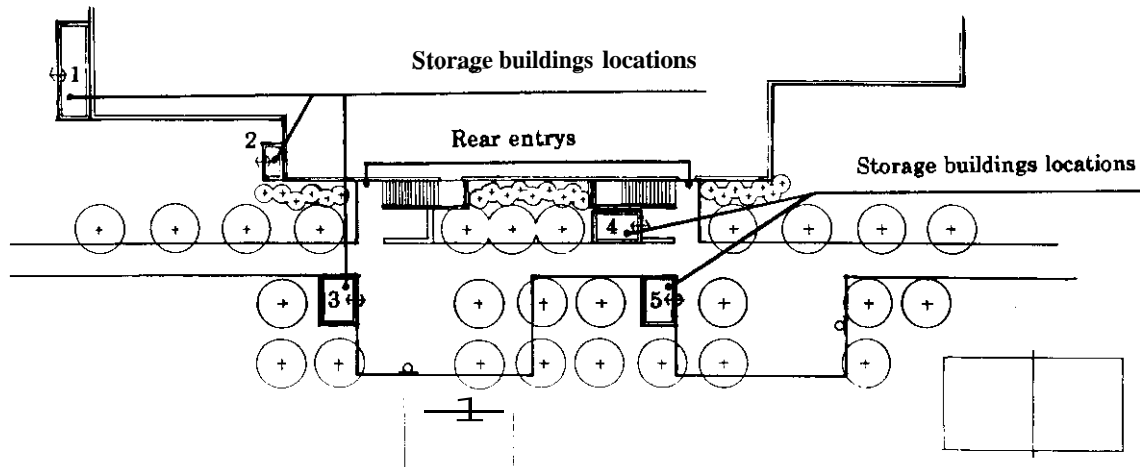
Sign letters may be cast into permanent materials such as concrete.

## BUILDINGS AND COURTYARDS

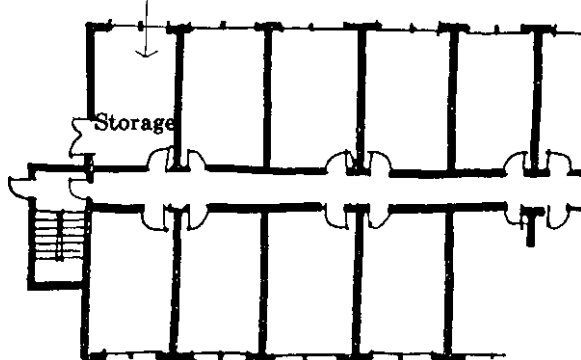
### OUTBUILDINGS

#### General Location and Siting

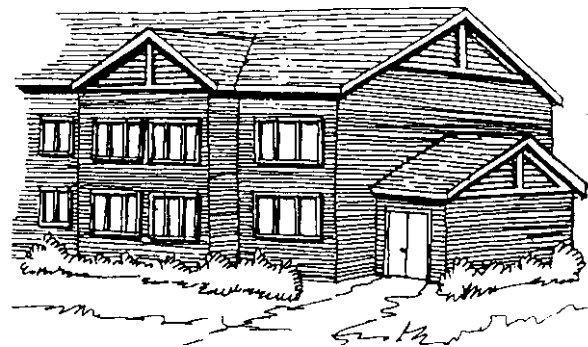
"Mushroom" buildings, i.e., free standing small storage buildings, shall be located in low visibility side or rear areas. Building materials should match or compliment those of adjacent permanent structures. Colors should match existing or be neutral in appearance. Buildings should be grouped to reduce "mushrooming" effects and all grouping that cannot be conformed to adjacent structures should be screened with vegetation and/or architectural elements. Where additional small storage areas are required, convert or designate interior building space as storage space where possible. In barrack areas several locations and sizes are suggested as shown in the drawing below.



Provide 2-hour fire rated surrounding walls with 1 1/2 hour interior doors



**First Priority - convert one or more rooms to storage**



**Second priority - storage additions to existing buildings must utilize similar materials, colors and forms**



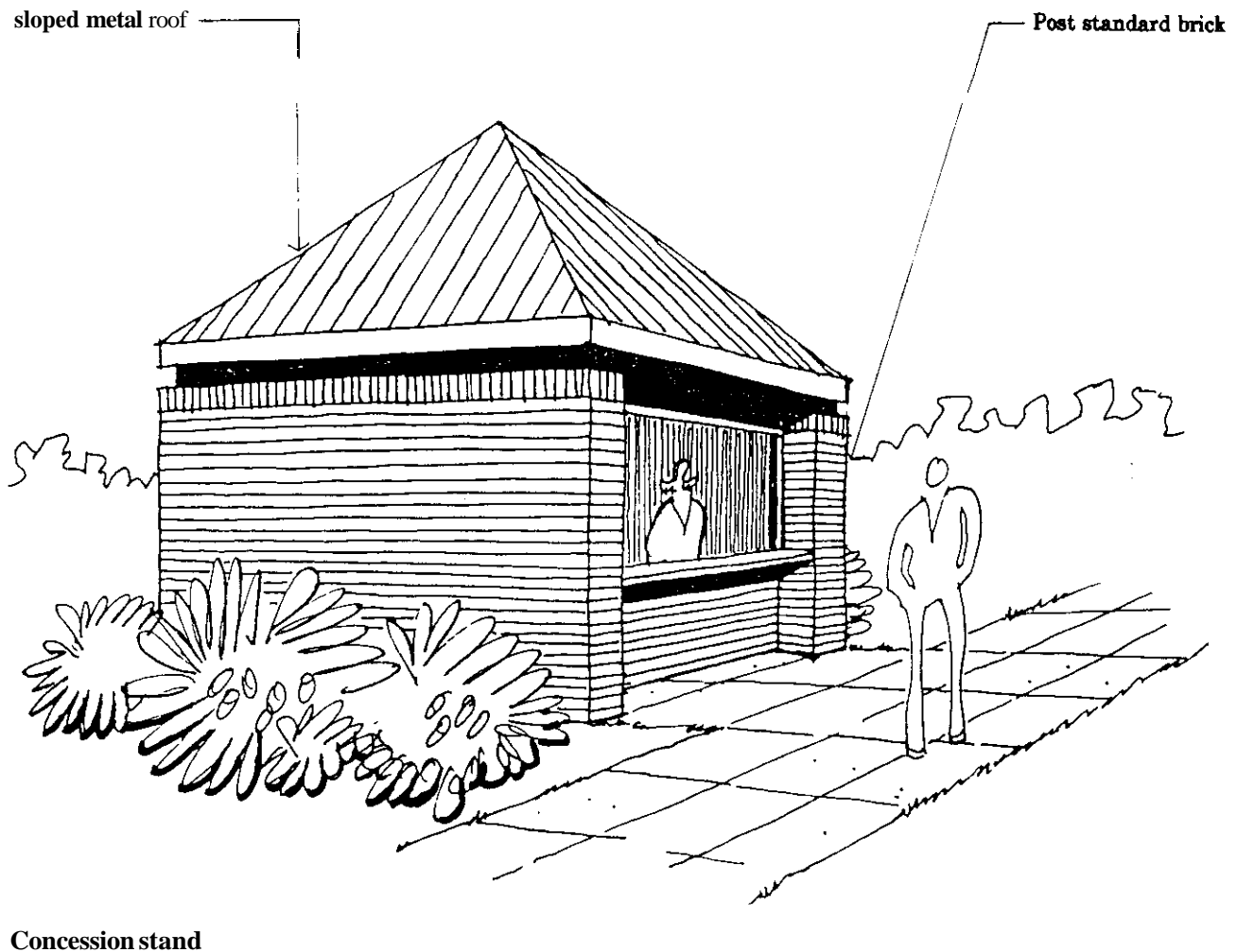
## BUILDINGS AND COURTYARDS

### OUTBUILDINGS

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#### High Visibility Structures

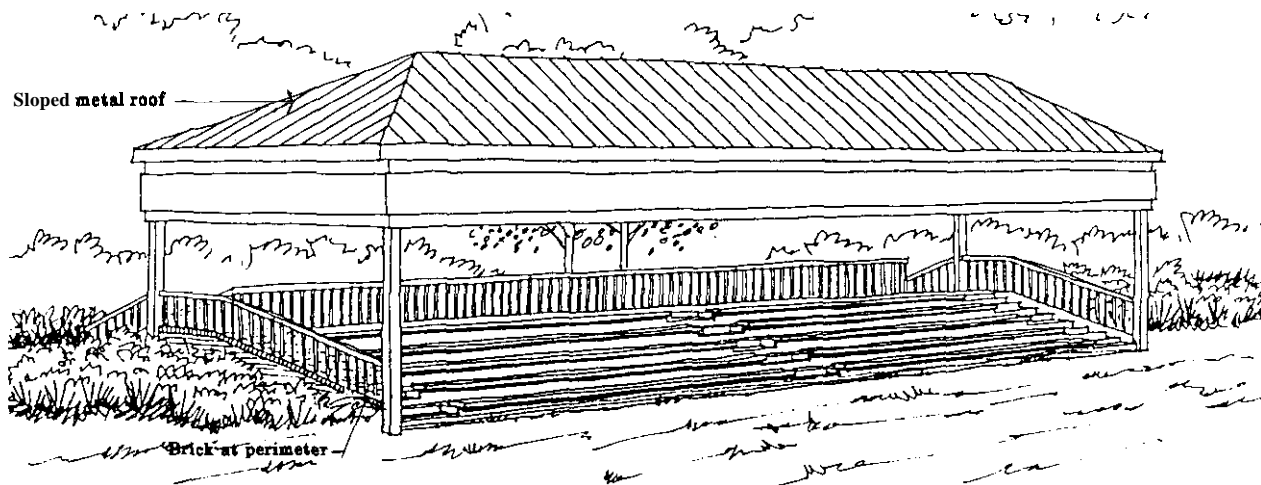
Outbuildings (small buildings of limited and usually utilitarian function) will generally be avoided. However, certain outbuildings are required for functional reasons, such as concessions stands which must be convenient to the open space they serve. When such outbuildings must be used in high visibility or high use areas, they will be of high quality design and details. Their architectural character shall be as directed for other buildings of their land-use zone and in sympathy to existing adjacent buildings that correspond to the requirements of their districts.



## BUILDINGS AND COURTYARDS

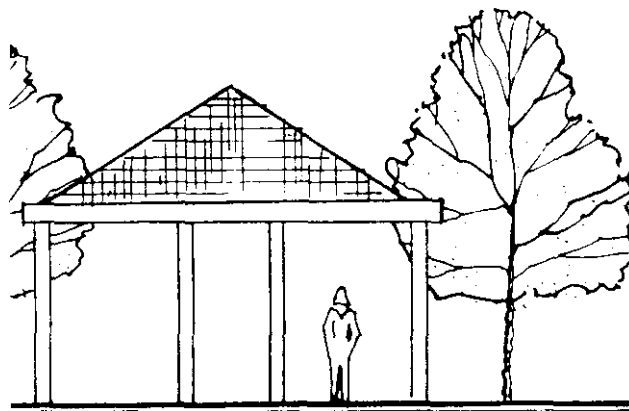
### OUTBUILDINGS

Some structures which can loosely be defined as "outbuildings", such as reviewing stands, are not actually buildings, but due to their mass and form, they make a strong visual statement and thus will be given considerable design attention. The term "architectural character" may not always be applicable. Character may be influenced by practical or structural demands but a high quality appearance must be achieved. Materials and colors must be consistent with Post standards and must be appropriate for their proposed use. Open structures must use materials and designs that can withstand climatic conditions which normally occur at Fort Jackson.



**Reviewing stand**

Training aid shelters/pavilions are used by troops for training and instruction. The pavilion is a covered area that may contain seating. **An** elevated stand is used by commanding officers to give commands and survey the troops. Instruction stands and pavilions shall be constructed of wood with a metal seam or fiberglass shingle roof. The stands shall be elevated but the pavilion shall be on grade. Troop identification is allowed on a 3 x 1 foot sign on one side of the pavilion announcing the troops that utilize the pavilion. The pavilions and stands shall be sited in hardscape assembly areas adjacent to barracks. Trees shall be planted around the pavilion in order to increase the amount of sheltered space. For seated instruction, bleachers may be located in the pavilion.

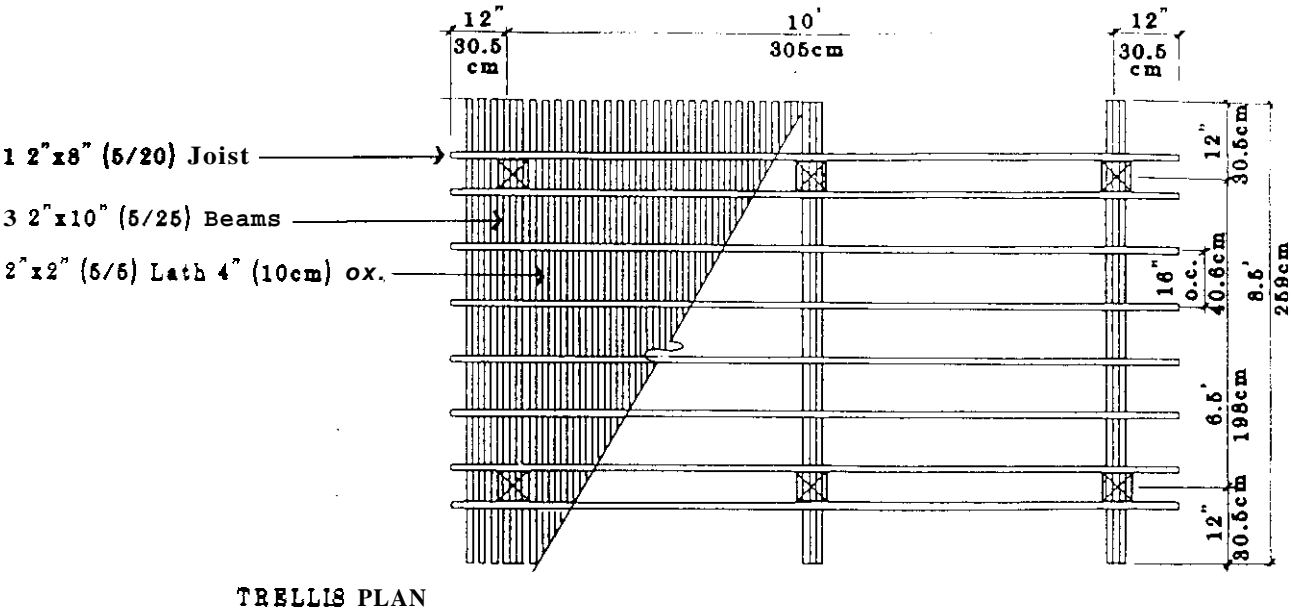
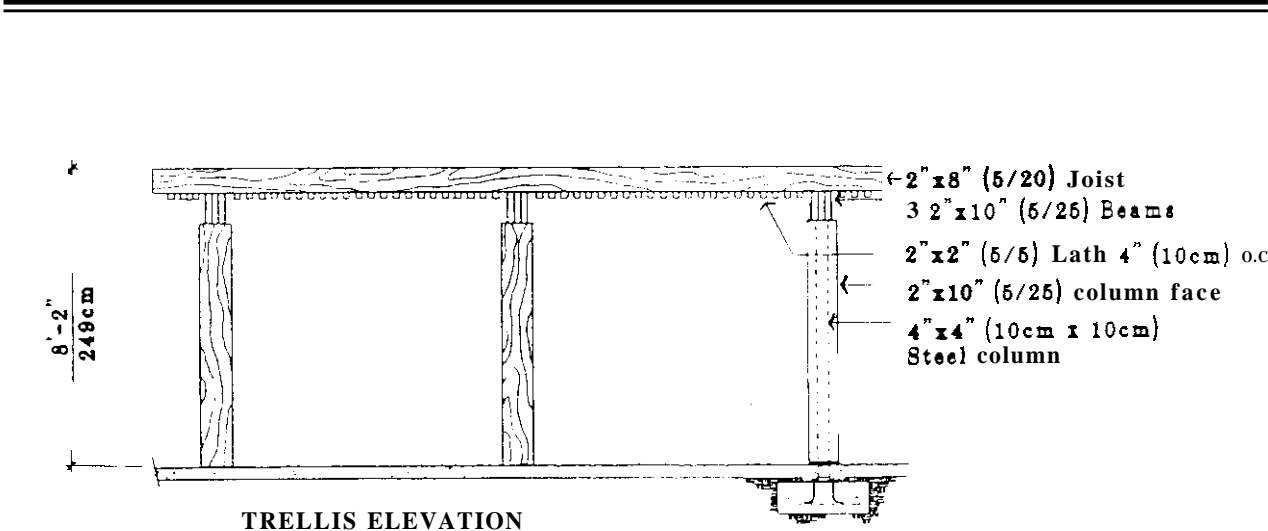


**Pavilion Elevation**



BUILDINGS AND COURTYARDS

OUTBUILDINGS



Typical Wooden Trellis

Typical Wooden Trellis



## BUILDINGS AND COURTYARDS

### OUTBUILDINGS

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#### Special Structures

Shelters and canopies located in vehicular service areas must take into account the maximum height of the largest vehicle which may enter the area. All such covers shall be supported by columns or pilasters that are protected from vehicular damage through the use of traffic islands and bollards. These supports shall be of a material that matches the exterior material of the adjacent buildings or of squared tubular steel that is painted to compliment the color of the adjacent building. The actual canopy shall also match the basic architecture of the adjacent structure, (i.e., flat canopy adjacent to a flat roofed building). Proportions of the canopy shall also be complimentary.

Structures used for the storage of hazardous or explosive materials shall be sited and constructed in accordance with NFPA 30 and NFPA 69. All applicable safety arcs shall be observed in site selection and the facilities shall be located in low use, low visibility areas. Flammable materials lockers shall be located a minimum of fifty (50) feet from inhabited buildings.

Training ranges, by their nature are usually located in remote, low visibility areas. All ranges shall be laid out and developed in accordance with applicable army regulations. All control buildings and range support structures will be developed in accordance with Design Guidelines for the Mission Support or Industrial Districts.

Enclosed structures shall be of brick or split face CMU's with sloped shed, gabled, or hip roofs clad in asphalt shingles. Firing pavilions shall be supported on naturally finished dimensional wood post columns with wooden truss roofing systems. Roofs shall be sloped as off set shed or gables, with asphalt shingle covering.



## BUILDINGS AND COURTYARDS

### OUTBUILDINGS

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#### Entry Areas & Security

Fort Jackson is an 'Open Post' with an incomplete physical security perimeter. Certain training activities occur in remote areas of the Installation which may pose safety problems to the public. These areas are fenced.

At present, there are three gates with gate houses which are actively used by Post personnel. From time to time these entries are closed or sealed.

Gatehouse design is to provide a clear, unobstructed view of the approach areas and drive. The Gatehouse is to be located on a protected traffic island and is to be the location of the primary communications and alarm systems for that entry area. Architectural design is to be similar to that of the recently developed Gatehouse at Gate 2 on Imboden Parkway.

Each area is also to provide a small pull-off parking area, landscaping, a refusal lane/turn-around, area locator map and welcome graphics. Additional security devices may also be required and include; removable roadway bollards, a public telephone, physical and/or visual screens adjacent to both sides of the entry drive, regulatory graphics, actual fencing and gates, etc. A public or Post bus stop may also be appropriate near this point of entry.

Additional information may be obtained from, "Physical Security - Levels of Protection" as published by the U.S.A.C.o E, Omaha District.





## BUILDINGS AND COURTYARDS

### RENOVATIONS AND ADDITIONS

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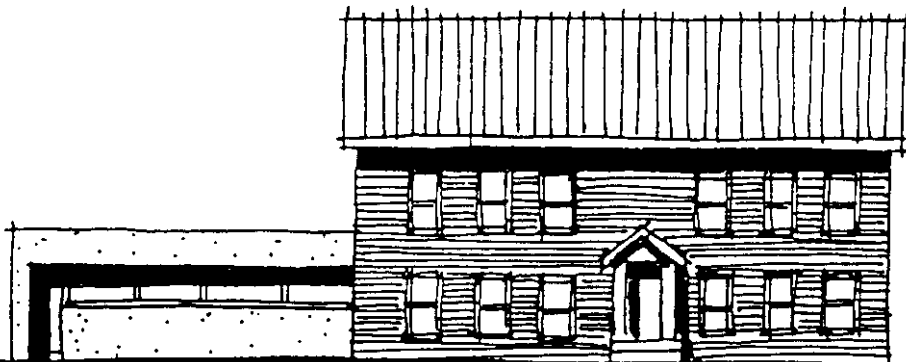
#### General Information

Architectural character, form and style shall be especially compatible between additions and the structures they are attached to. Basic rhythm, scale, roof form, massing, texture, materials, color etc. must be maintained. It is not necessary for the addition to imitate exactly the motif established on the existing building, especially when the existing building is of relatively low design quality. In these cases, the opportunity exists for a general renovation of the existing structure. Such renovations are to be considered in **all** such cases.

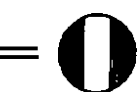
Use same roof covering and roof pitch



This



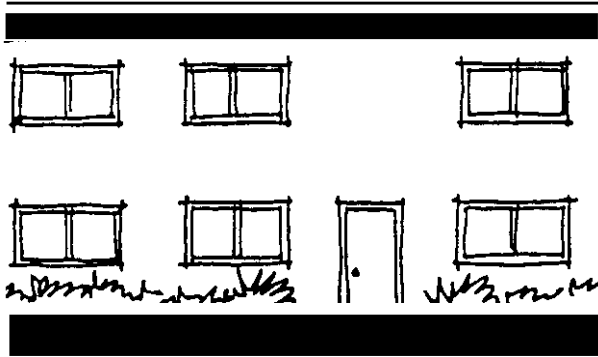
Not this



## BUILDINGS AND COURTYARDS

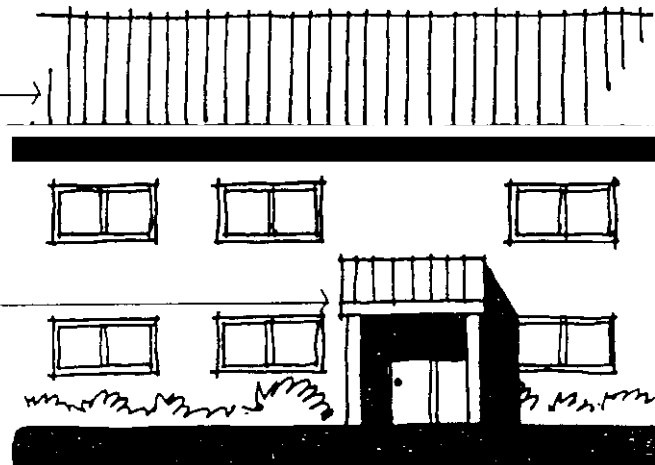
### RENOVATIONS AND ADDITIONS

Renovations provide the opportunity to change materials which are no longer serviceable and add form enriching elements which would result in a building more consistent with the character established for the **Post**. Other objectives described for new buildings, such as covered entry elements, climate responsive elements, etc. are to be incorporated.



Before renovation

Replace old flat roof with new  
"Post" standard metal roof



New entry canopy to provide rain  
protection, entry identification  
and architectural interest

After renovation

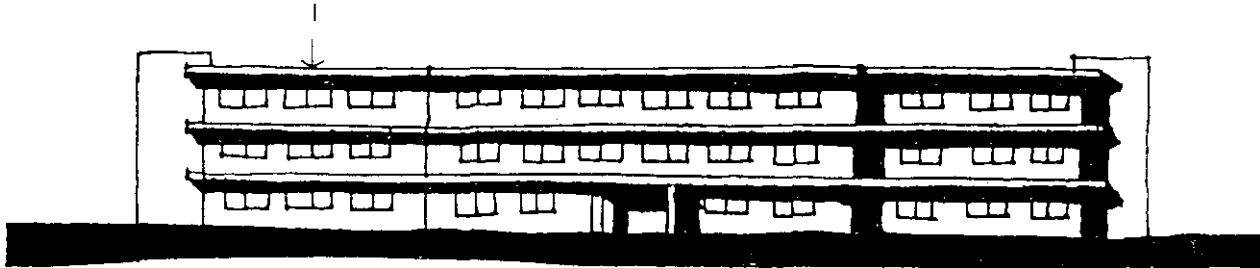
## BUILDINGS AND COURTYARDS

### RENOVATIONS AND ADDITIONS

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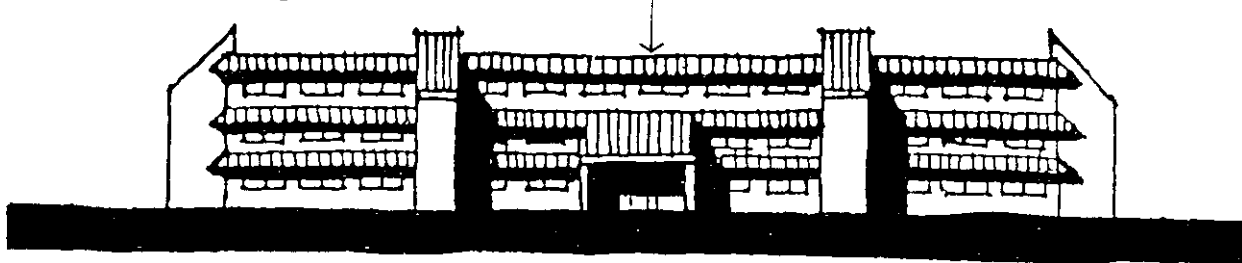
Where existing buildings to be renovated have flat roofs which are not causing major maintenance problems, add sloped roof elements in order to bring the building in character with the Post standard. Such elements **work** particularly well at stairs and at window canopies (for sun shading). Other sloped roof elements can be entry canopies, added interior and/or exterior storage space or other needed interior space.

Existing flat roof



Before renovation

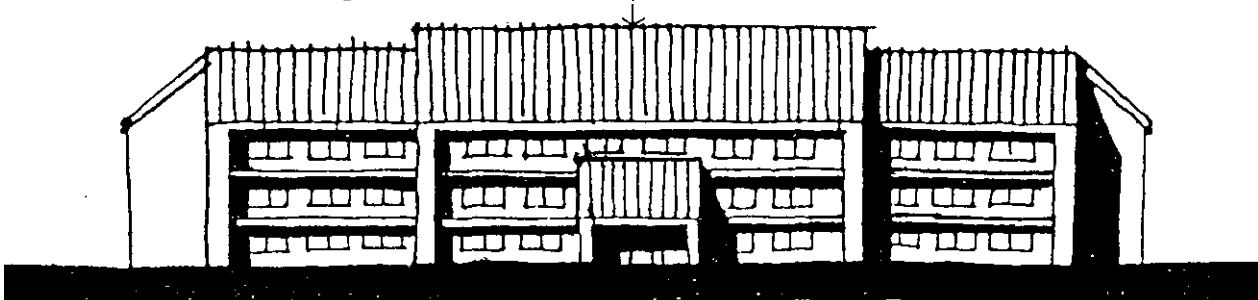
Flat roof remains with sloped metal roof elements added



After renovation

Repair by replacement should be considered as an alternative to continual maintenance of problem building elements, such as roofs or roof structures. When repair by replacement is warranted, consider potential design improvements at this time.

New sloped metal roof replaces problem flat roof



After replacement

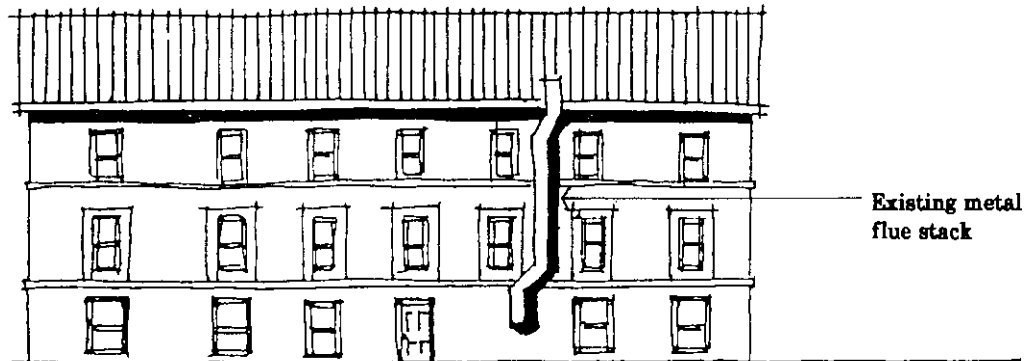


## BUILDINGS AND COURTYARDS

### RENOVATIONS AND ADDITIONS

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All necessary exterior utility elements are to be removed or screened in a manner that is compatible with the architecture of the building. All other such elements are to be enclosed by a new architectural element.



Before renovation



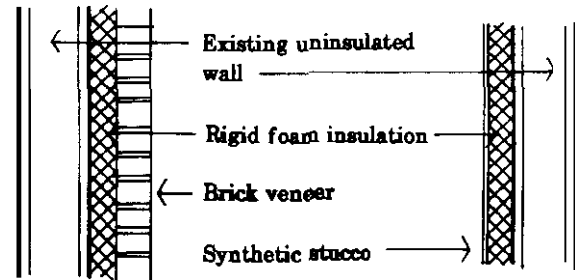
After renovation

## BUILDINGS AND COURTYARDS

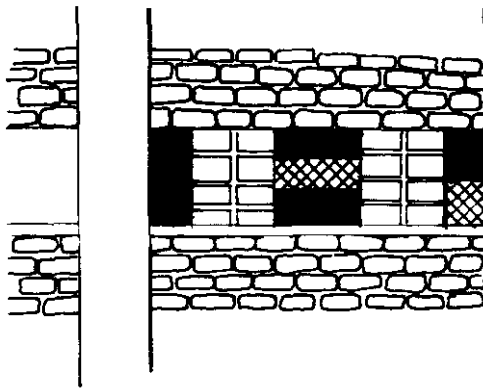
### RENOVATIONS AND ADDITIONS

Materials have been discussed on pages 1.5.1 thru 1.5.3, but additional consideration for exterior wall materials includes the following:

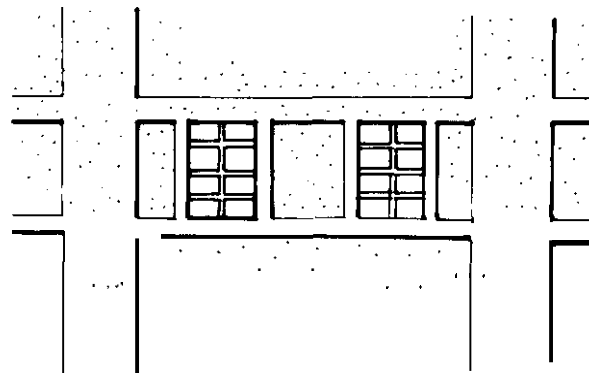
1. For existing buildings with year round climate control and poor insulation, consider brick veneer with rigid insulation in the cavity or a synthetic stucco system (such as "Dryvit") which has rigid insulation as an inherent part of its assembly.



The synthetic stucco system has the advantage over real stucco in terms of facilitating character enriching details such as accent bands, raised window trim, cornices, etc.



**Before**



**After**

2. For existing buildings requiring little or no year-round climate control and of exposed concrete unit masonry, consider stucco applied directly to the masonry if unpainted and applied over metal lath if the masonry is presently painted.

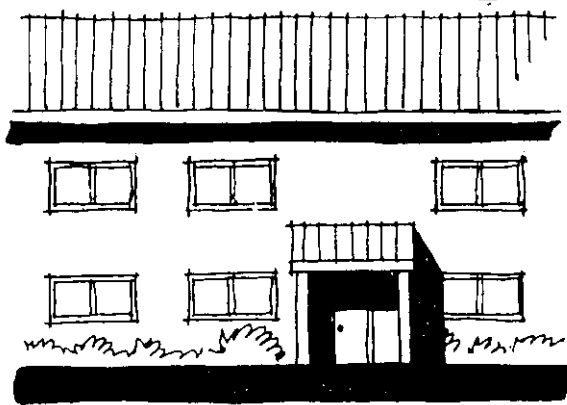


# BUILDINGS AND COURTYARDS

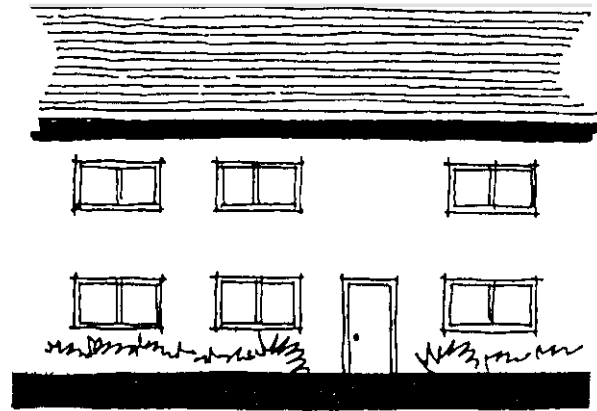
## ENTRANCES AND ACCESS

### Entrances

Building entrances should be readily distinguished as the "entrance" on all buildings. The primary method of distinguishing the entrance is by manipulating the form and mass to provide a three dimensional element, i.e., some form of cover at the entrance door. This may be done by a projecting roof element or by creating a void under the floor(s) or roof above. In addition to providing recognition, such covers will also provide for rain protection. Not all exterior doors are entrances. Doors to utilitarian spaces or emergency exit doors should be played down in favor of the entrance(s).

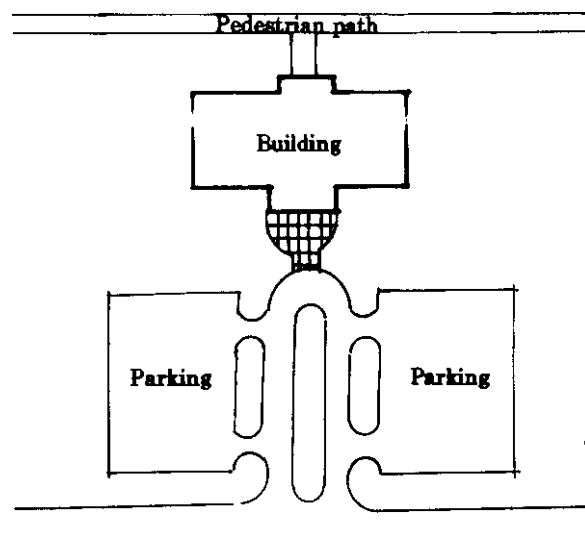


**This:** Roof cover provides entry recognition, rain protection and adds interest



**Not this:** Building and entrance appear to be of minor importance

Location of building entrances should be a careful balance between the desired site plan arrangement and the internal functional (floor plan) layout. Where a building is located between two parking lots or a parking lot and a major pedestrian way, the building should be provided with two (or more) "entrances". The form and entrance should be adjusted to signify their relative importance.



## BUILDINGS AND COURTYARDS

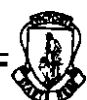
### ENTRANCES AND ACCESS

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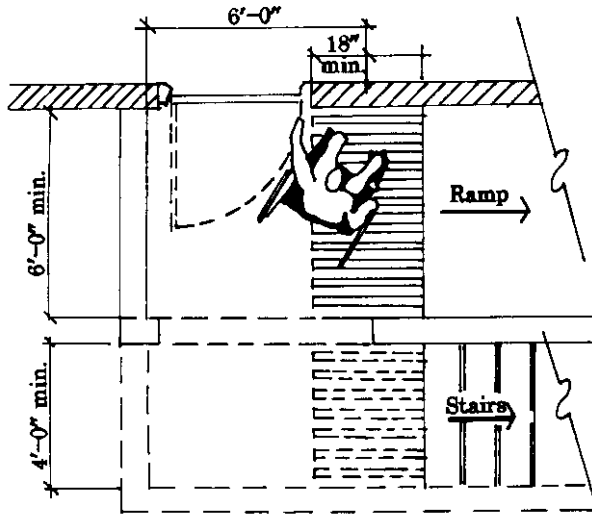
**Mass and form** should reflect the relative importance of the particular entrance to its own building as well as to other buildings. Certain administrative and community facility buildings should have more prominent entrances than other buildings. Entrys to Administrative, Community Facility and Mission Support buildings are to be clearly and prominently featured through the use of a three dimensional or permanent projecting element such as a vestibule, porch or gable. These entry areas shall be a prominent location along the building's facade and face the most active use area available to or on the site. Additional features such as canopies, awnings or free standing trellises may also be used to project the entries of the more important structures into the site.

For less important buildings or ones that are not in high use areas, the minimum entry treatment shall provide rain protection through the use of a canopy or awning. Entries to such structures or to structures located in industrial or operations areas shall be clearly marked and protected in order to assure the safety of personnel as they exit into operating areas of the yard or shops.



# BUILDINGS AND COURTYARDS

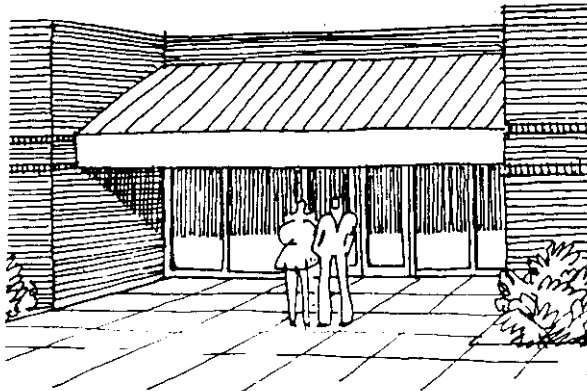
## ENTRANCES AND ACCESS



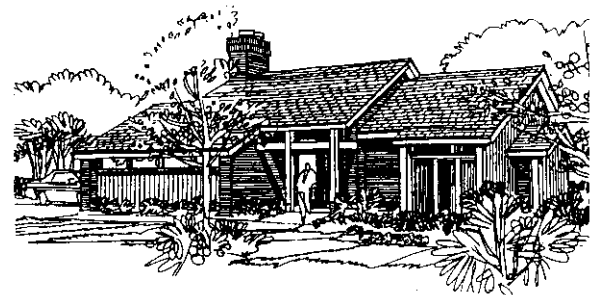
### Access

At least one major entrance per multi-family building shall be designed for convenient access by the physically handicapped in accordance with criteria established by DOD 4270.1-M, Chapter 18.

**Avoid steps. Provide grade level entries or ramps on buildings and homes.**



Appropriate entry to a building



Appropriate entry to a housing unit

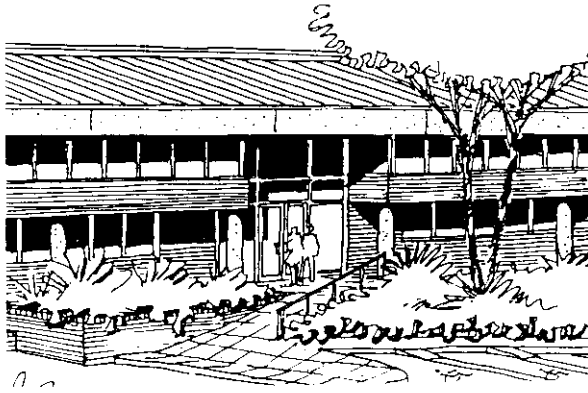




## BUILDINGS AND COURTYARDS

### ENTRANCES AND ACCESS

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#### Ramps

Ramps of grand form and proportion may be used as the only access to main building entrances. Ramps don't have to be off to the side of steps as they so frequently are, nor are they just for the handicapped.

## BUILDINGS AND COURTYARDS

### COVERED WALKWAYS

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#### General Information

Covered walkways shall be provided whenever there is significant pedestrian traffic between nearby exterior entries. A good example of this is shopping facilities. Another example is related communities facilities such as health services. Other possibilities include many different administrative, community facility or mission support buildings where people must frequently walk from building to building. In such instances, not only can covered walkways be functional in providing rain and sun protection for the pedestrians, but they can act as a unifying design element.

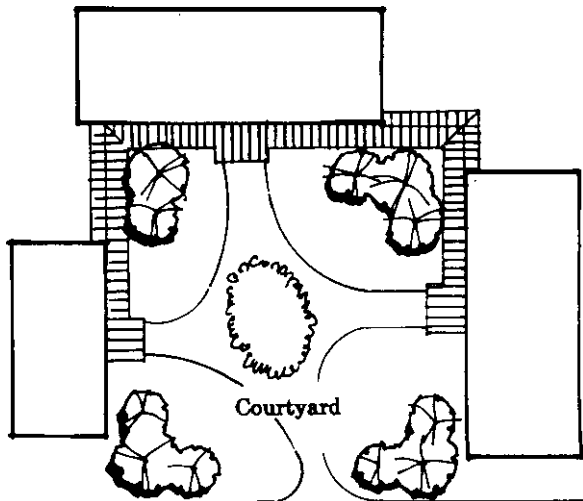
#### New Buildings

First priority for new buildings with covered walkways is to locate them under the main roof or the floor above in the case of multi-story buildings. Avoid designs which look as if the walkway was added on.



## BUILDINGS AND COURTYARDS

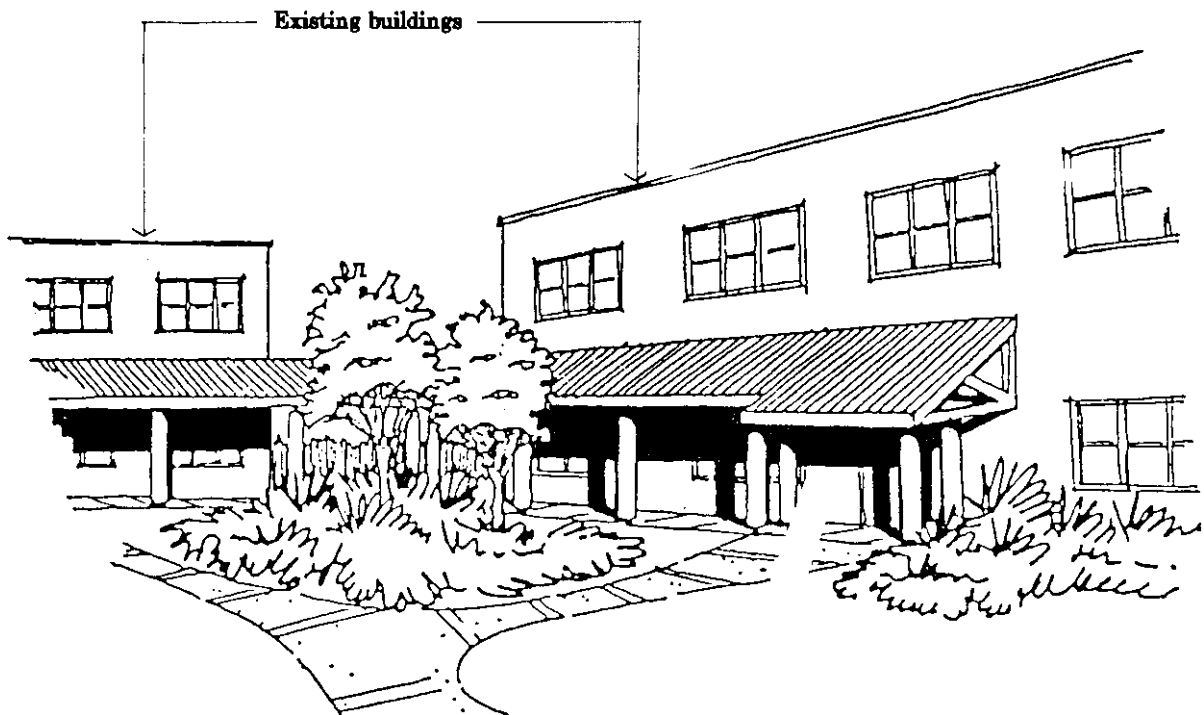
### COVERED WALKWAYS



Covered walkway added helps to define courtyard space

#### Existing Buildings

For existing buildings, walkways will have to be "added on", but must be done in a manner consistent with the architectural character established for the particular land-use zone. For example, where existing buildings have flat roofs, add sloped metal walkway roofs to relate the building to the new desired image. At the same time, such walkway roofs can add interest to typically plain buildings, give a more human scale, and provide solar shading for at least some of the glazing.



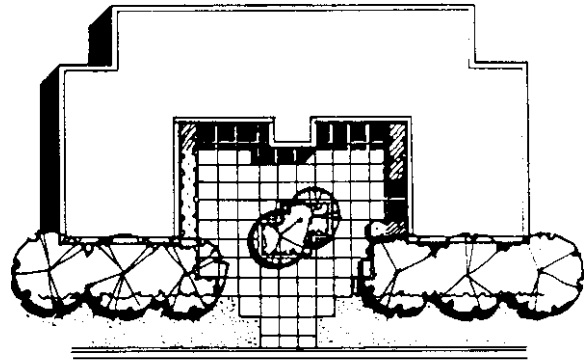
# BUILDINGS AND COURTYARDS

## PLAZAS AND COURTYARDS

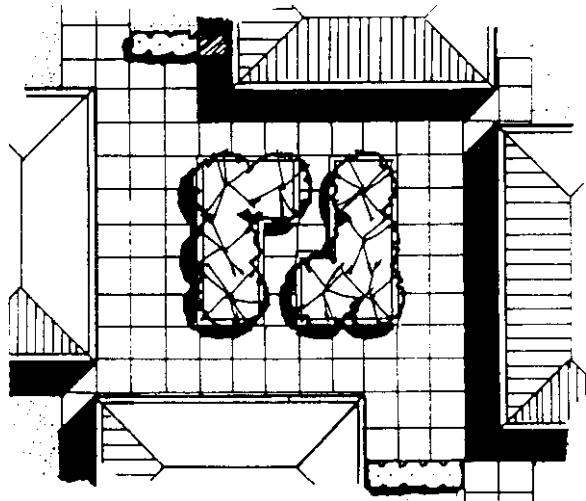
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Provide plazas or courtyards to form a grand entrance to important buildings or as an outdoor "refuge" between buildings or within a single building. Buildings surrounding a plaza or courtyard shall interrelate from a functional point of view.

**Plazas** are open on one or more sides, i.e., not "contained by buildings or landscaping. Such plazas are particularly suitable as entry spaces to very important buildings. They may be paved such as an entry area or grassed such as a parade field.



**Courtyards** are spaces enclosed by buildings and landscaping on four sides, i.e., a "contained space". Courtyards may be used as a space from which to enter related buildings or they may be a quiet refuge within a building or "behind a group of buildings.



# BUILDINGS AND COURTYARDS

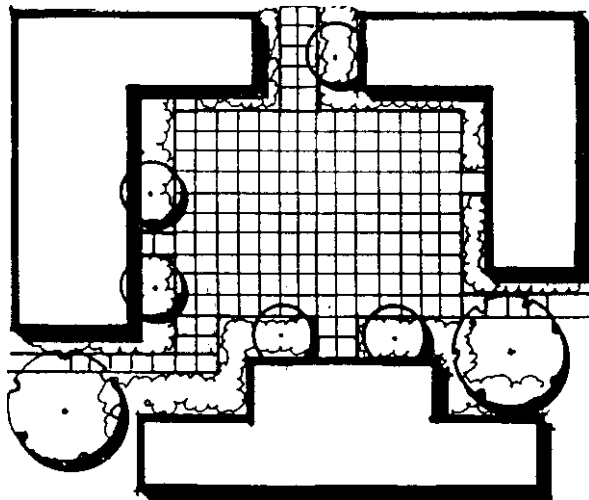
## PLAZAS AND COURTYARDS

### Parade Grounds and Ceremonial Spaces

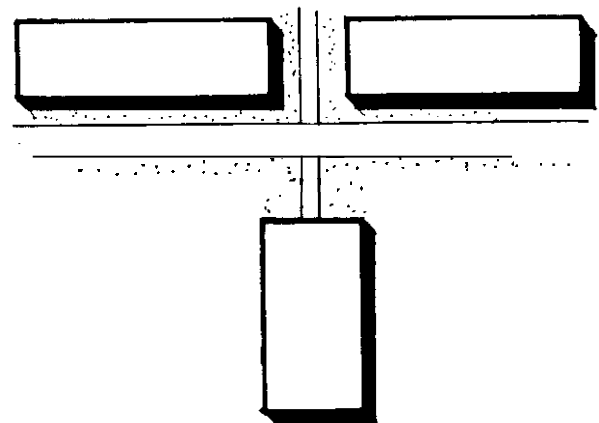
Ceremonial parade grounds, such as Darby or Hilton Fields are among the highest visibility spaces on Post and are often a point of first impression for visitors. The planned development of such spaces is important in establishing the desired image of Fort Jackson. There are several positive elements of a parade ground. First, the site should be relatively flat and of a size sufficient for the types and number of units to be reviewed. The space should be defined by adjacent buildings, trees or other plantings, but views to distant focal points should not be excluded. Near distance views should be attractive with all negative elements being discreetly screened. The fields should be rectangular with two principal axes with the main or long axis leading to some focal point such as a dominant building or memorial space.

Something as simple as a landscaped flagpole or two museum quality static displays forming an entry gate may be used. The shorter axis should focus on the reviewing stand and visitor entry area. This area must be attractive and compatible with it's surroundings, while providing the basic needs of seating, shelter, restrooms, entry and speaker/awards plaza. (See Outbuildings, Section 1.8 of this chapter).

Spatial Enclosure should be definite and distinct, whether formed by separate buildings, wings of a building, landscape elements, or a combination. There should be a definite sense of entrance to the courtyard.



This



Not this

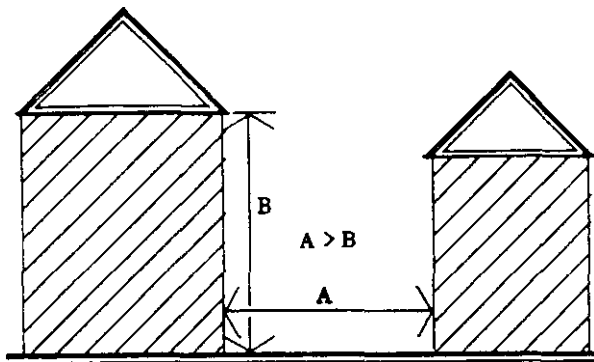


## BUILDINGS AND COURTYARDS

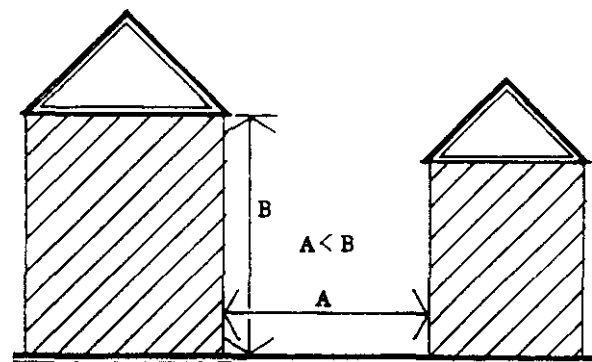
### PLAZAS AND COURTYARDS

Materials should emphasize the use of brick as pavement or pavement accents and site retaining or planter walls. First priority of paving materials is all brick. Second priority is exposed aggregate (pea gravel) concrete with brick accent bands. Third priority is rock salt textured concrete with brick accent bands. Last priority is broom finished concrete. Avoid large expanses of concrete paving. Priority shall be determined by the level of design for the project.

Proportions should be controlled such that the width of courtyards should be greater than the height of adjacent buildings in either direction. Also, the length of the courtyard should be no greater than twice its width.

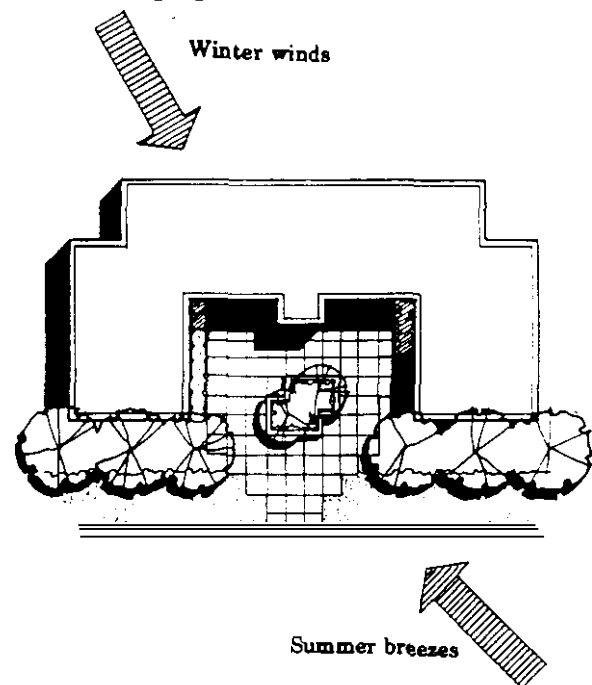


Vertical proportions



Horizontal proportions

Orientation should insure that courtyards do not remain in shadow throughout the day. Avoid prevailing winter winds and allow for summer breezes where possible.

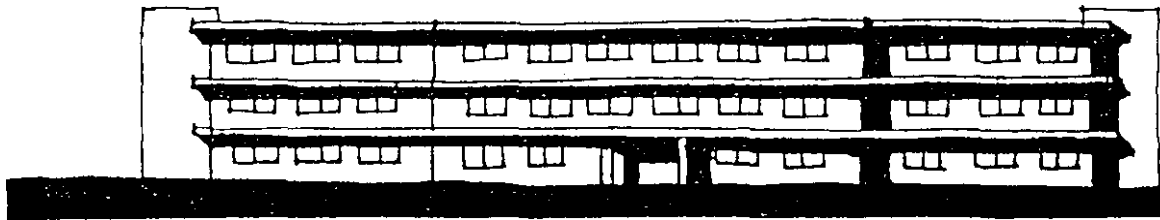


# BUILDINGS AND COURTYARDS

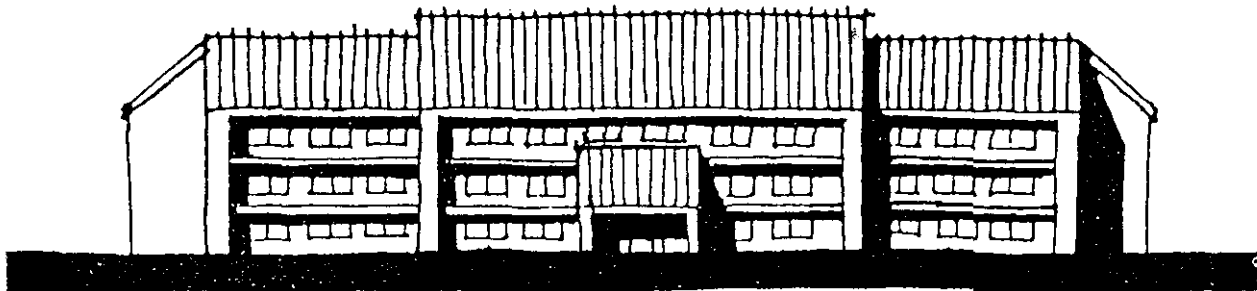
## ADAPTIVE DESIGN

### Adaptive Design

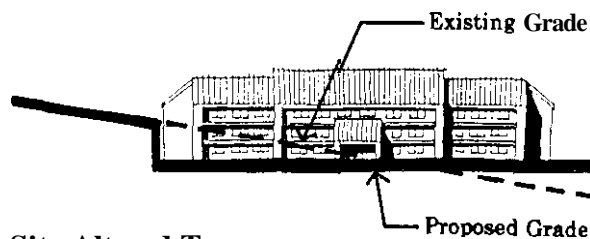
"Adaptive design" is used here to mean the "adaptive design" of prototypical plans furnished to the designer by the Department of the Army or others. When the designer is required to adapt a prototypical design for this Post, he must follow all recommendations of the "Design Guide", as if it were a totally new design. Usually this will mean only minor changes in floor plan design, but significant changes to the exterior skin.



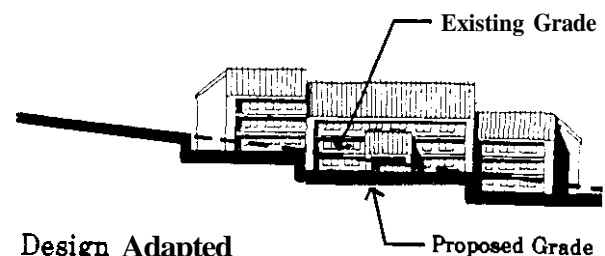
Prototypical design



Adapted design



Site Altered To  
Accomodate Design—Avoid if Possible



Design Adapted  
To Site — Preferred Solution

When siting new structures or expanding existing structures, care is to be taken in avoiding construction within wetlands, flood plains, archeological sites and other such sensitive areas. Initial site investigations shall be performed in order to determine the existence of sensitive areas before any construction begins.



## BUILDINGS AND COURTYARDS

### MECHANICAL EQUIPMENT & BUILDING SERVICES

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#### General Information

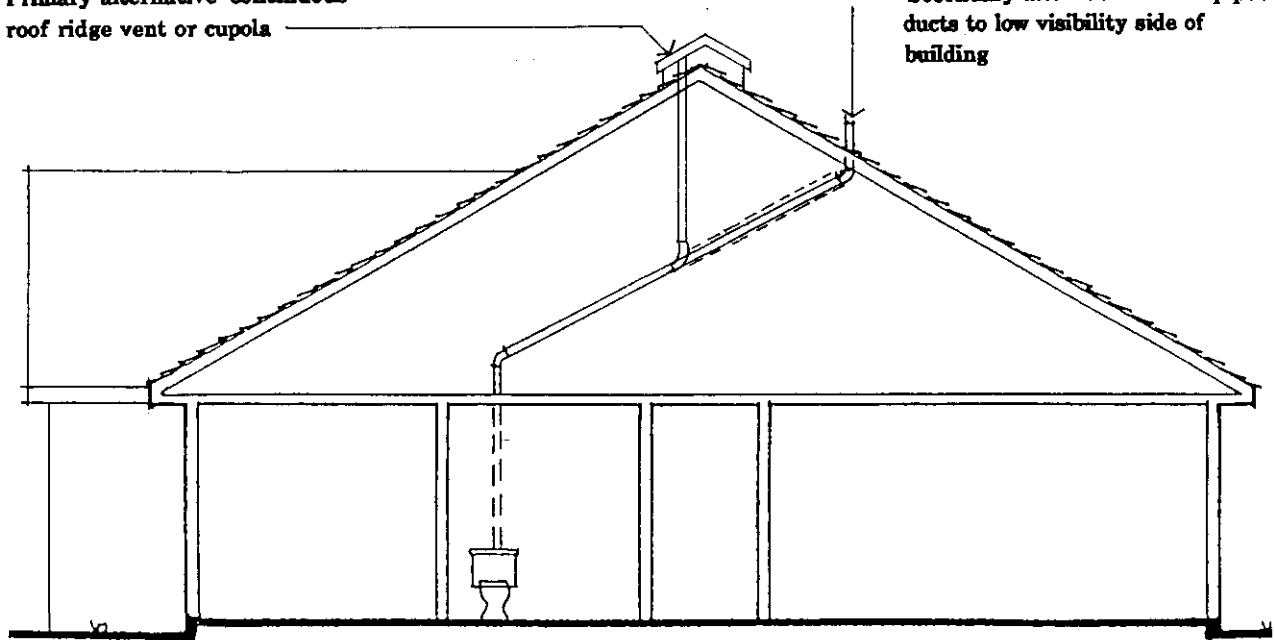
This section covers the treatment of visually undesirable elements which are functionally necessary. These elements include, dumpsters, pad mounted transformers, HVAC equipment, exhaust fans, plumbing vent stacks, etc. Although such building elements are unavoidable, they should not be visible from somewhere. They should not be visible to casual building users or passers-by. For new buildings, all such items must be dealt with in the initial design. After the fact fixes are not acceptable. For existing buildings, see Page 1.9.1 - "Renovations & Additions."

#### Roof Penetrations

When possible, elements which pierce the roofing system are to be routed to exit through continuous ridge roof vents or cupolas placed on the roof ridge. Where this is not possible, such utility elements are to be routed so that the penetration is on the lowest visibility side of the structure.

Primary alternative—continuous  
roof ridge vent or cupola

Secondary alternative—route pipes/  
ducts to low visibility side of  
building



Building cross-section





## BUILDINGS & COURTYARDS

### COMPATIBILITY

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#### General Information

In order to achieve uniformity in design throughout the Post, buildings in close proximity to one another shall be compatible in design. It is not intended for all buildings to look the same but they must blend with each other. This is to be accomplished in several ways, but in general, it requires that the buildings share similar design elements such as windows, roof forms and exterior materials. The basic rule of thumb is that all building designs should be outstanding but none should "stand-out".

Where the adjacent building is a temporary building, there will be no attempt to achieve compatibility. Where the adjacent structure is a permanent building of low design quality, the new building design shall be somewhat sympathetic to the adjacent, but complete compatibility will not be achieved. In the future, these incompatible buildings should be demolished or renovated to be consistent with the intended image for the Post.

#### Massing

A large facility can be made to better relate to existing smaller facilities by dividing its mass into smaller components to create a building elevation that is more compatible or complimentary to the adjacent structures in terms of its size and proportions. This is to be accomplished by manipulating the configuration of the floor plan and/or building height to break down the mass of the building into smaller elements.



Compatible massing



Incompatible massing

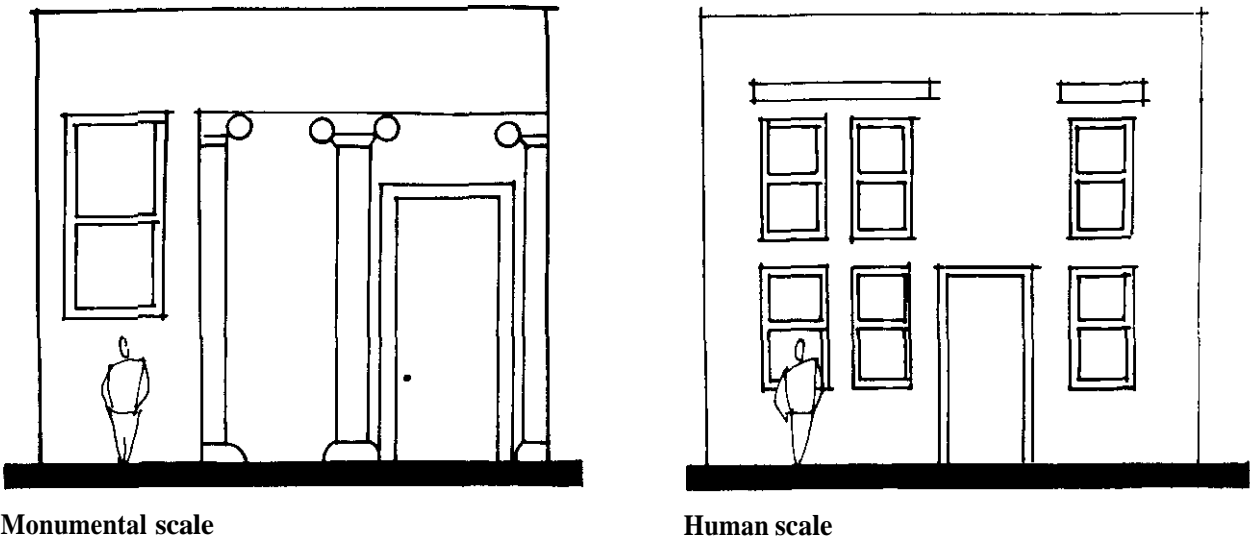


BUILDINGS & COURTYARDS

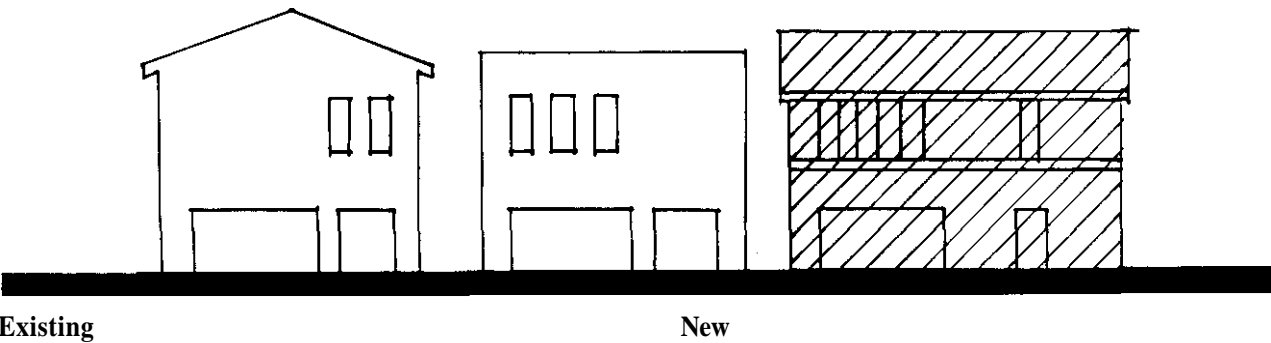
COMPATIBILITY

Scale

Building designs shall be proportioned and detailed to be compatible in scale. Since scale is greatly conveyed by the building fenestration, this will also mean that the size and proportions of windows will be similar.



Compatible scale/fenestration

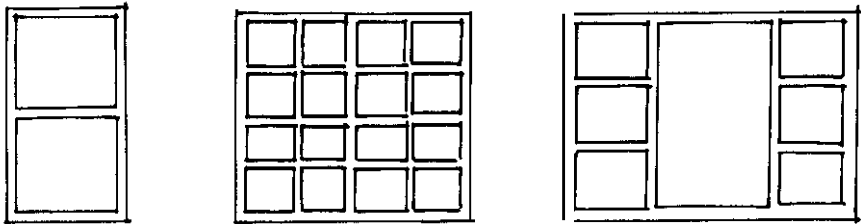


BUILDINGS & COURTYARDS

COMPATIBILITY

Window Styles

Window styles must be compatible with adjacent buildings. Although a certain amount of variety is encouraged, windows should not range from large expanses of glass to finely divided small windows, for example. However, windows under deep overhangs are not **as** critical, in terms of compatibility, **as** windows on the wall surface, since shadows will diminish their prominence **as** a design element.



Compatible window styles



Incompatible window styles



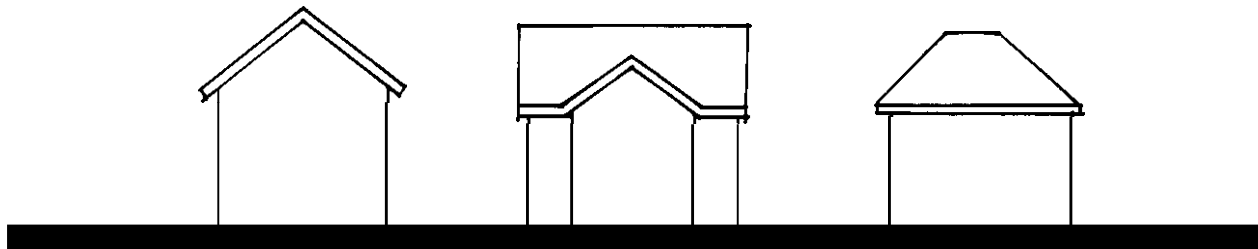
## BUILDINGS & COURTYARDS

### COMPATIBILITY

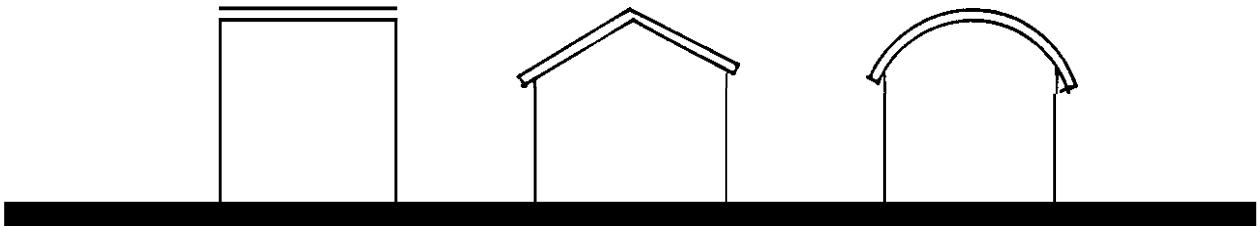
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#### Forms

Ideally, building forms, particularly roof forms, should be compatible between adjacent buildings. This level of compatibility will be difficult to achieve on this Post since many existing buildings have flat roofs and yet, the new intended image includes sloped metal roofs. To compensate, new buildings with sloped roofs adjacent to existing buildings with flat roofs should be especially compatible in terms of other design elements such as scale, massing, windows and/or exterior materials. Where it is feasible, adjacent buildings should have similar roof forms. This can include several different types of pitched roofs: hip, gable and shed.



Compatible roof forms



Incompatible roof forms



## **ROADS & PATHS**

### **GENERAL INFORMATION**

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#### **General Information**

Roads and paths will be one of the most costly elements to develop on Post. Both vehicular and pedestrian circulation systems are a must and should be efficient and sensitive to the topography of the Post. The circulation system should functionally and visually reflect a logical hierarchy of traffic circulation. Circulation systems, especially streets, are one of the most powerful form generators in the landscape.

These guidelines shall be implemented in all new construction and as repairs or renovations are executed on existing roads and parking areas.

#### **Radii**

To provide safe and adequate turning room, the following standards shall be implemented for intersection curb line radii.

- Primary Road - 40 feet
- Secondary Road - 30 feet
- Tertiary Road - 25 feet
- Parking Lot Entrance - 20 feet
- For an illustration or hierarchy see page 2.2.1

#### **Slopes**

All roads shall be graded with a crown or high point in the center. This is generally the preferred method of drainage used in conjunction with curb and gutter.

A road without curb and gutter will generally be drained by a gentle cross slope that follows the lay of the land. Each drainage method must have a minimum of 1% slope for positive drainage.



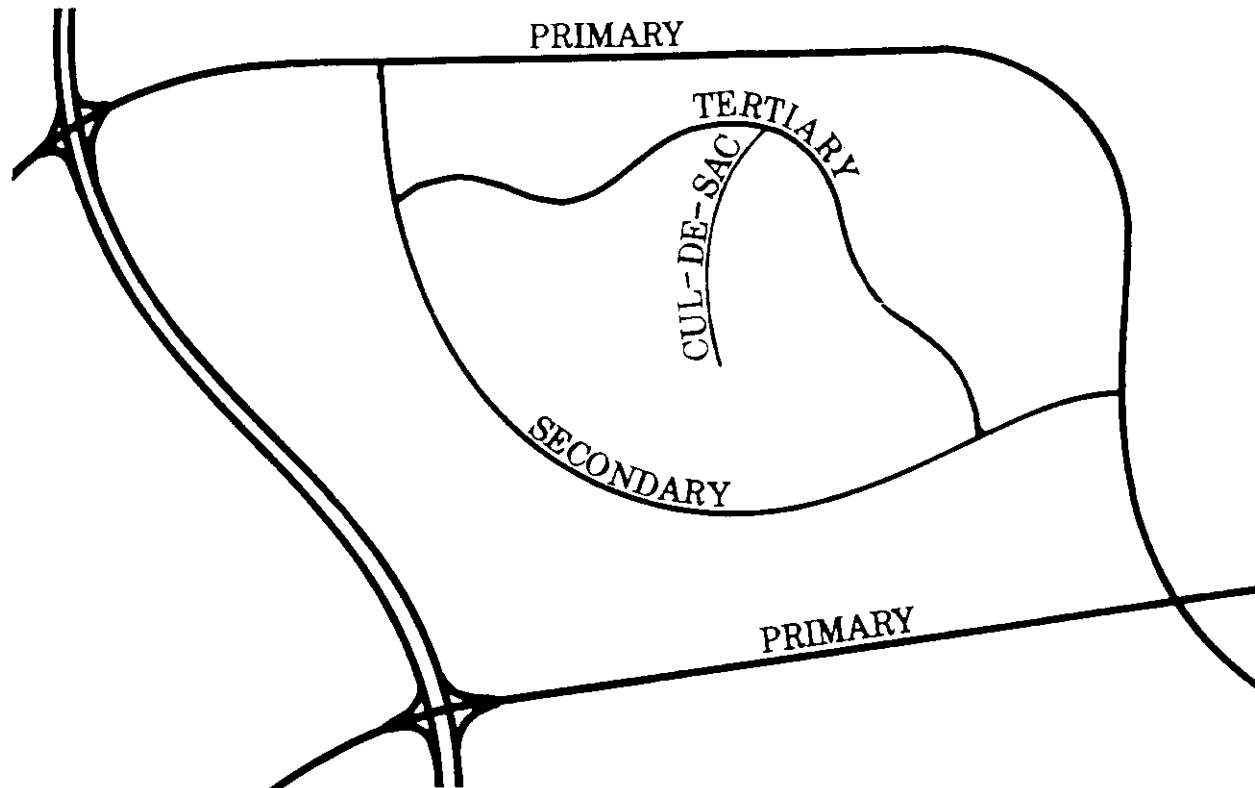
## ROADS & PATHS

### ROAD HIERARCHY

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#### Road Hierarchy

The vehicular circulation system should functionally and visually reflect a logical hierarchy of trafficways. The roads at Fort Jackson are divided into five categories: primary, secondary, tertiary, cul-de-sacs, and rural in relation to their order of importance.



#### Road Hierarchy

**Primary** roads are 2 to 4 lane roads designed for speeds over 40 m.p.h. and may or may not be divided. No on-street parking is allowed. (Class 'A', 12' lanes, median vanes).

**Secondary** roads connect tertiary roads to primary roads. These are designed for speeds under 40 m.p.h. No on-street parking is allowed. (Class 'B', 12' lanes).

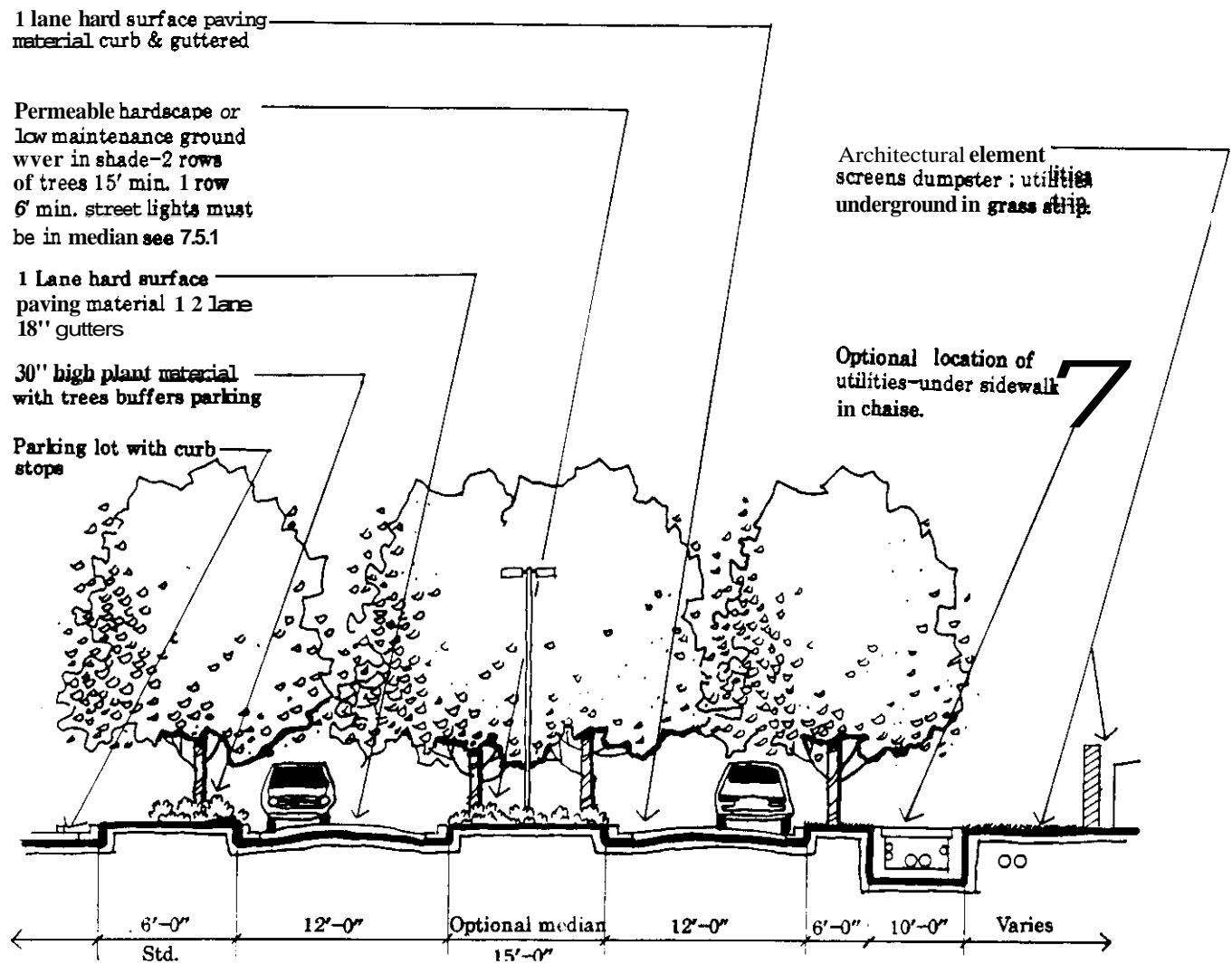
**Tertiary & Cul-de-sacs** are roads which handle local traffic at low speeds. On-street parallel parking is allowed in some cases as permitted by DEH (Class 'C', 11' lanes).



# ROADS & PATHS

## ROAD HIERARCHY

### Primary 2 Lane



## ROADS & PATHS

### ROAD HIERARCHY

#### Secondary 2 Lane

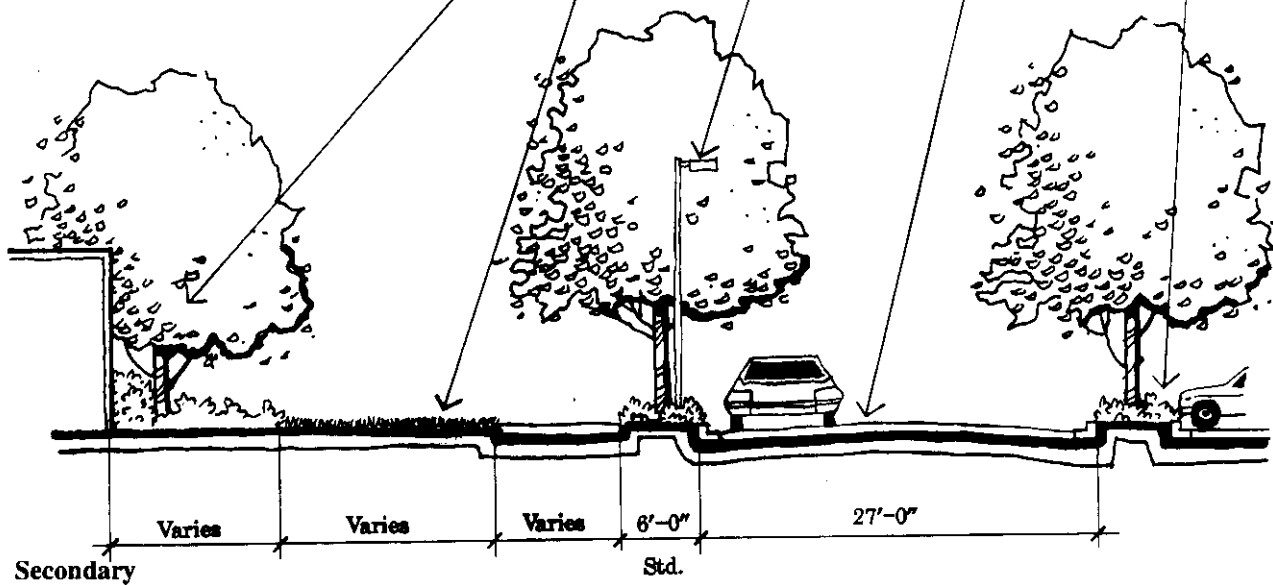
Parking lot screened ~~with~~ street trees and a shade loving shrub border.

2 lane bard surface paving material with curb and gutter 12' lanes, 18" gutters

Lights are located a minimum of 2 foot off edge of curb

If ~~utilities~~ are not located under the sidewalk they should be placed in grassed areas under-ground

Buildings simply landscaped





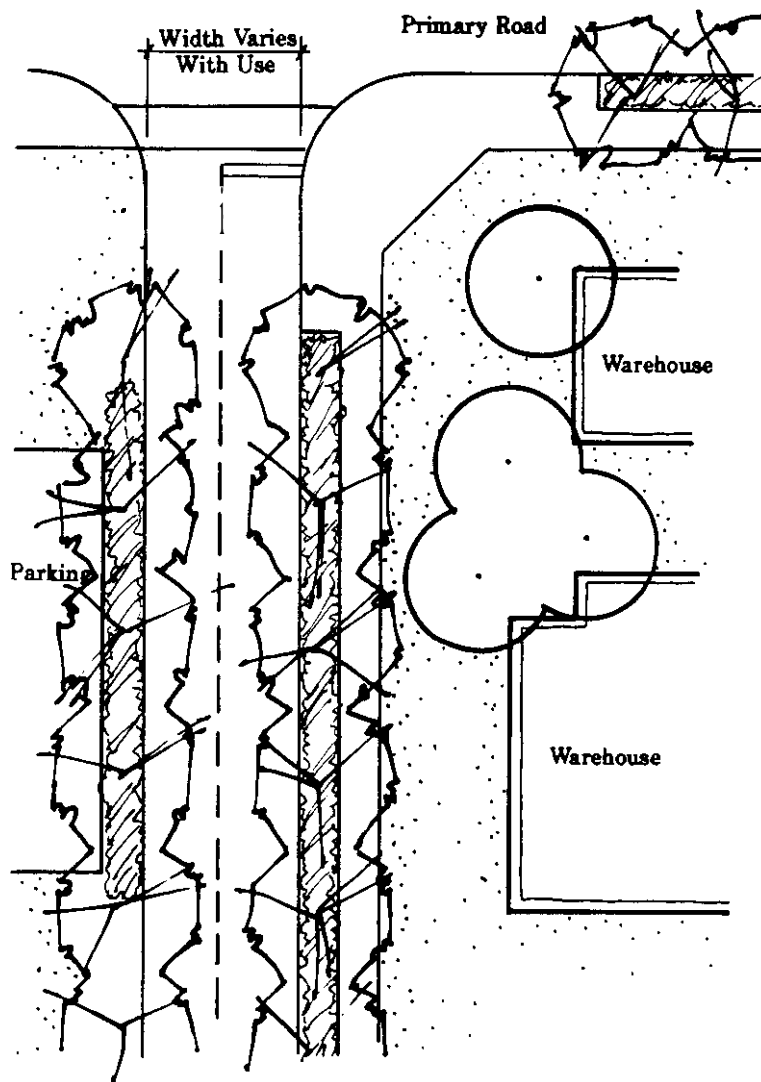
## ROADS & PATHS

### ROAD HIERARCHY

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#### Secondary 2 Lane

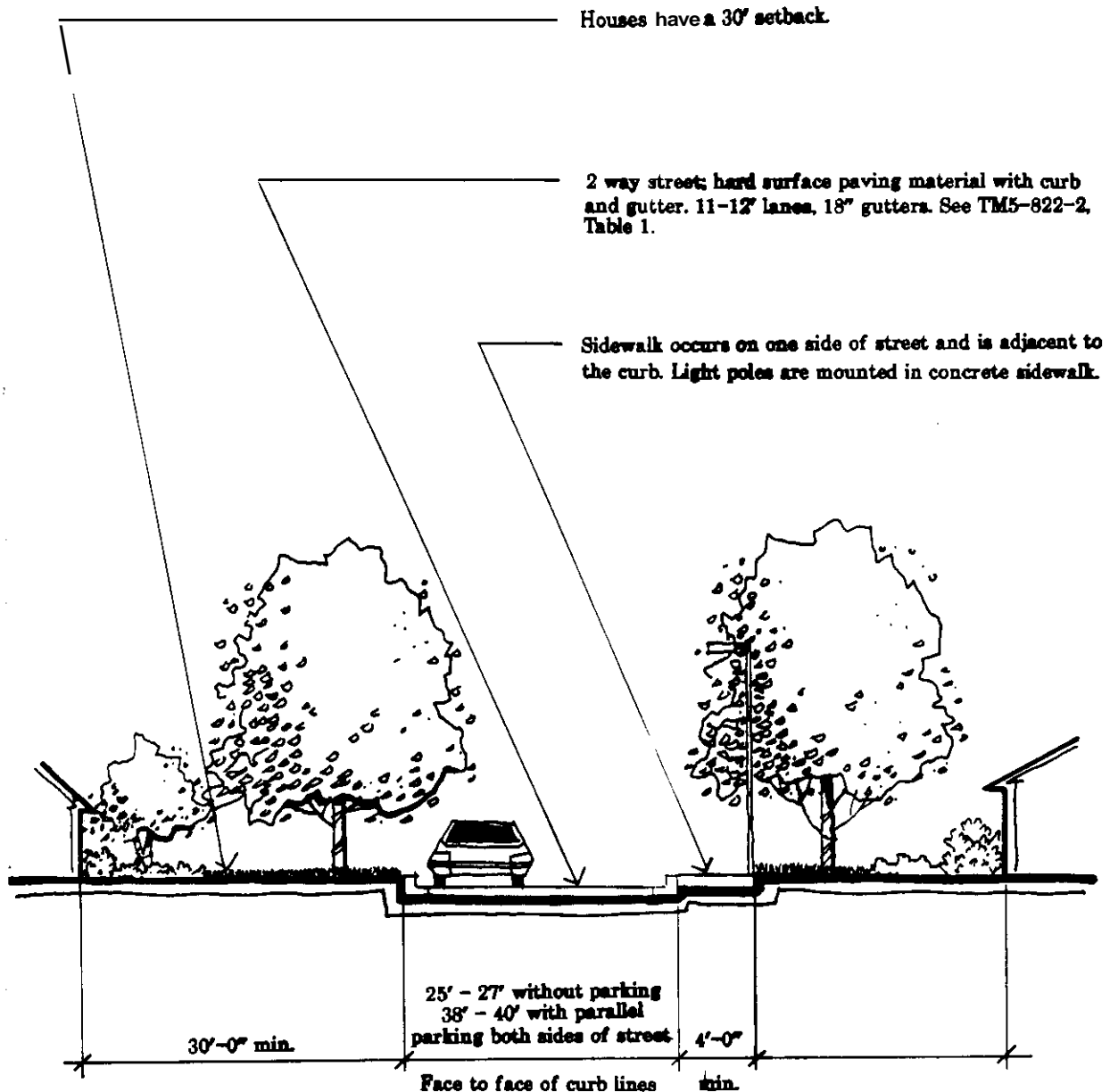
Roads entering an industrial area shall present an attractive, well landscaped appearance. If divided, the lanes will be a minimum of 12 feet. In other sections of the industrial area, the width of the road will depend on the function of the building that the road serves. Appropriate widths should be determined by an engineer. Roads, parking lots and pedestrian walks shall be clearly defined in this zone. The landscape treatment defines the entrance, screens parking and from the outside looking in visually relates to the rest of the Post.



## ROADS & PATHS

### ROAD HIERARCHY

#### Tertiary/2 Lane

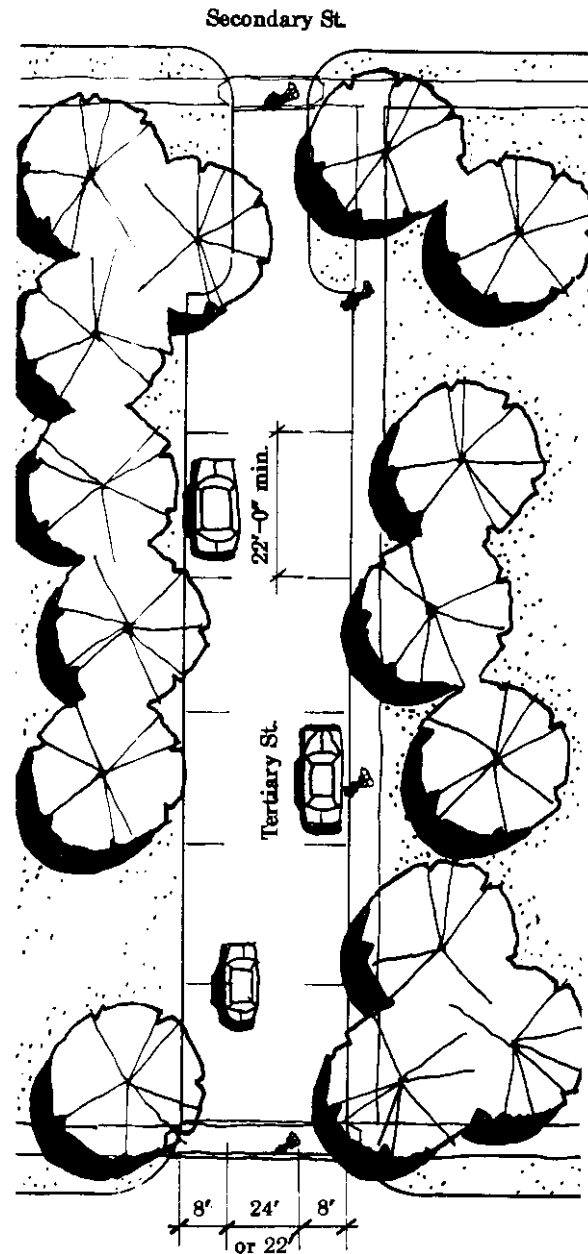


## ROADS & PATHS

### ROAD HIERARCHY

#### Tertiary/2 Lane

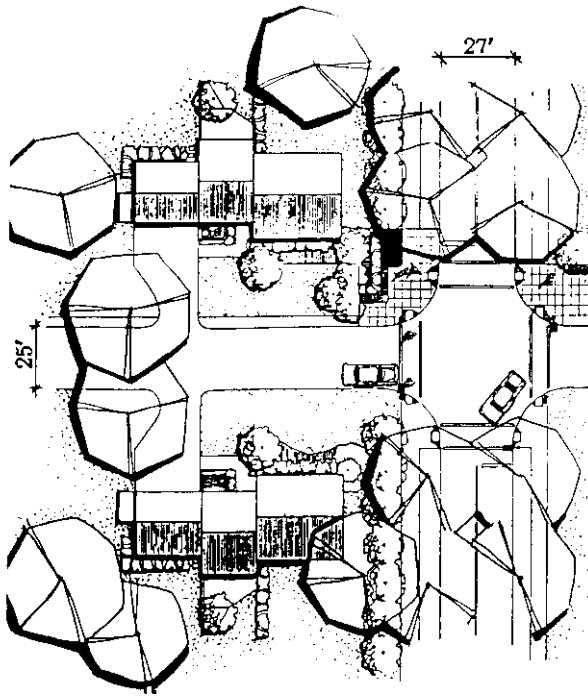
Parallel parking is permitted only on tertiary surface and cul-de-sac roadways. Sidewalk is located on one side of street only. A regular street tree planting is not required on tertiary streets but trees are to be used to frame buildings.



## ROADS & PATHS

### ROAD HIERARCHY

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#### **Tertiary/2 Lane**

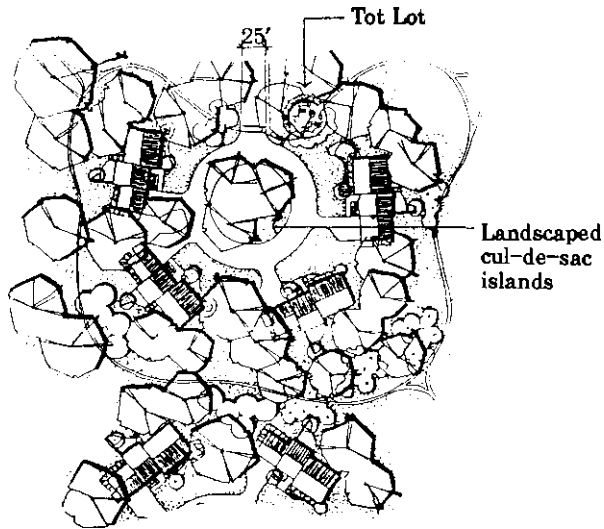
This plan shows various appropriate ways of dealing with intersections of secondary and tertiary streets. Curb cuts occur at all crosswalks. Sidewalks occur only on one side of the street, preferably the south or west side. Trees and shrubs are used to buffer housing areas from secondary streets. Landscaping is also used to buffer bus shelters and seating areas. Bus shelters should be located in a manner so that when the bus stops to pick up passengers it doesn't block traffic.



## ROADS & PATHS

### ROAD HIERARCHY

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#### Cul-de-sac

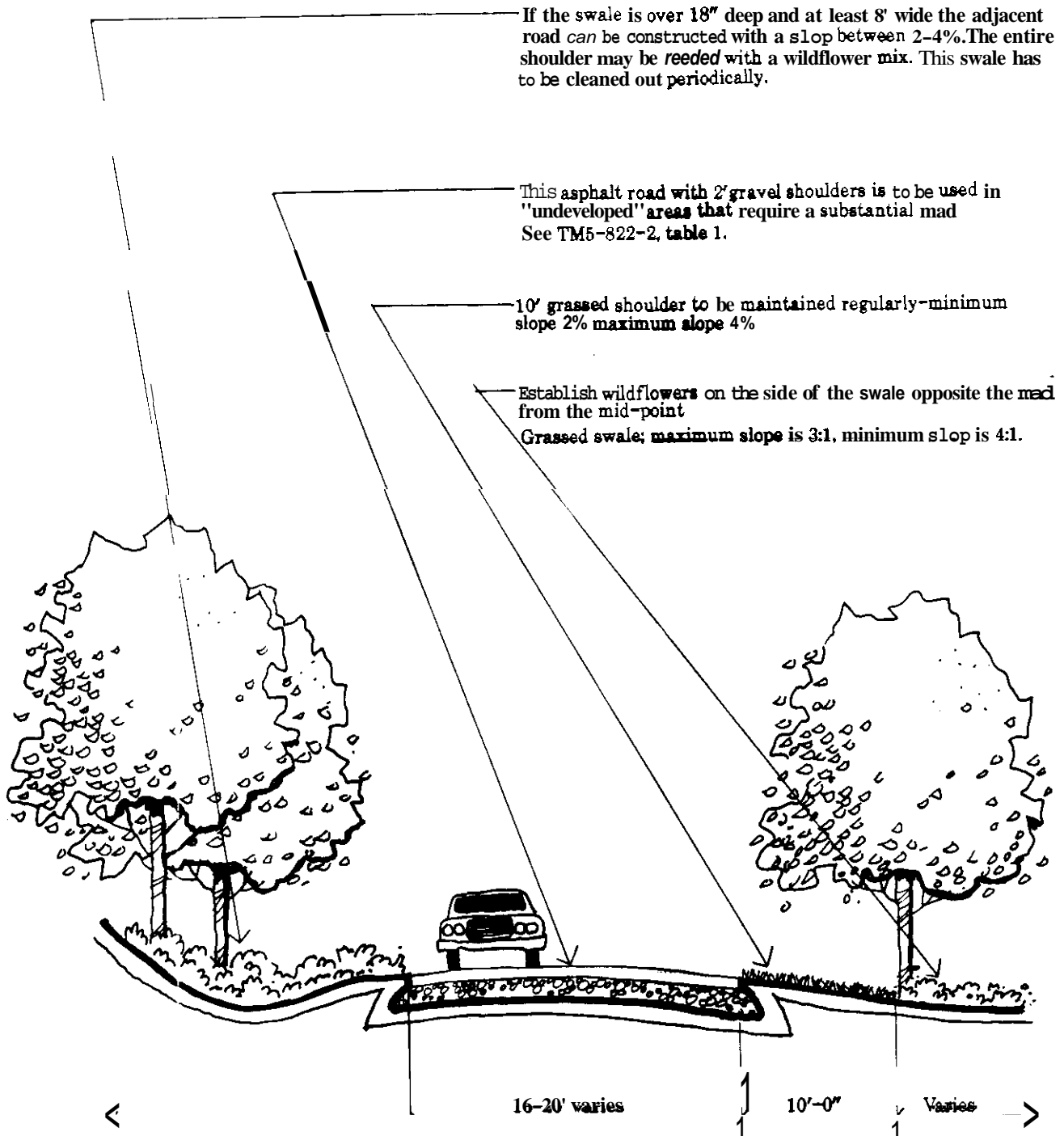
The circulation system should include a shared path between cul-de-sacs. On cul-de-sacs that have more than 10 units there will be a landscaped island. Units shall have a minimum setback of 30 feet. Tot lots shall be a minimum of 1000 square feet. A group mailbox and bench shall be located at the tot lot entry.



# ROADS & PATHS

## ROAD HIERARCHY

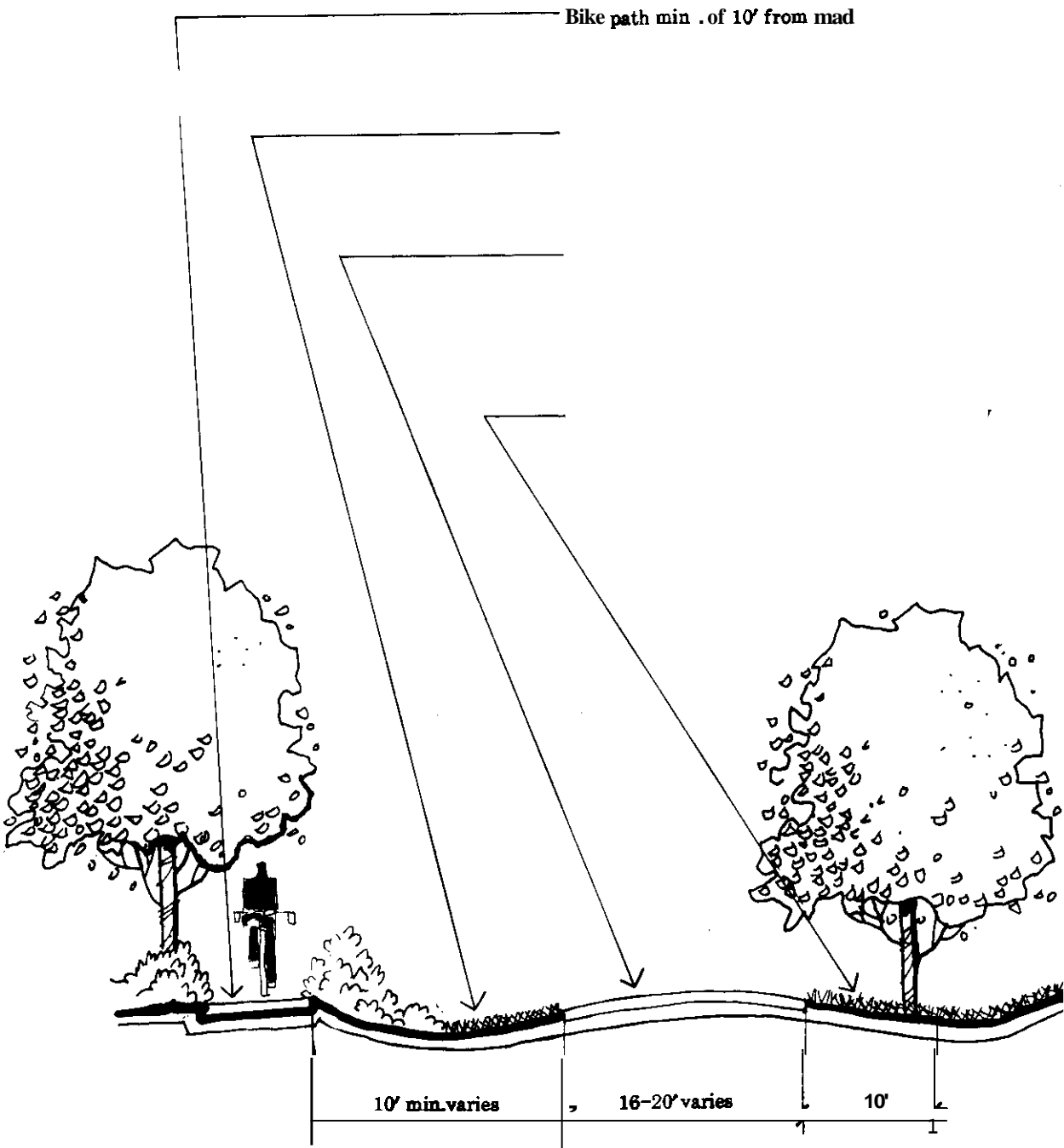
### Rural Road



ROADS & PATHS

ROAD HIERARCHY

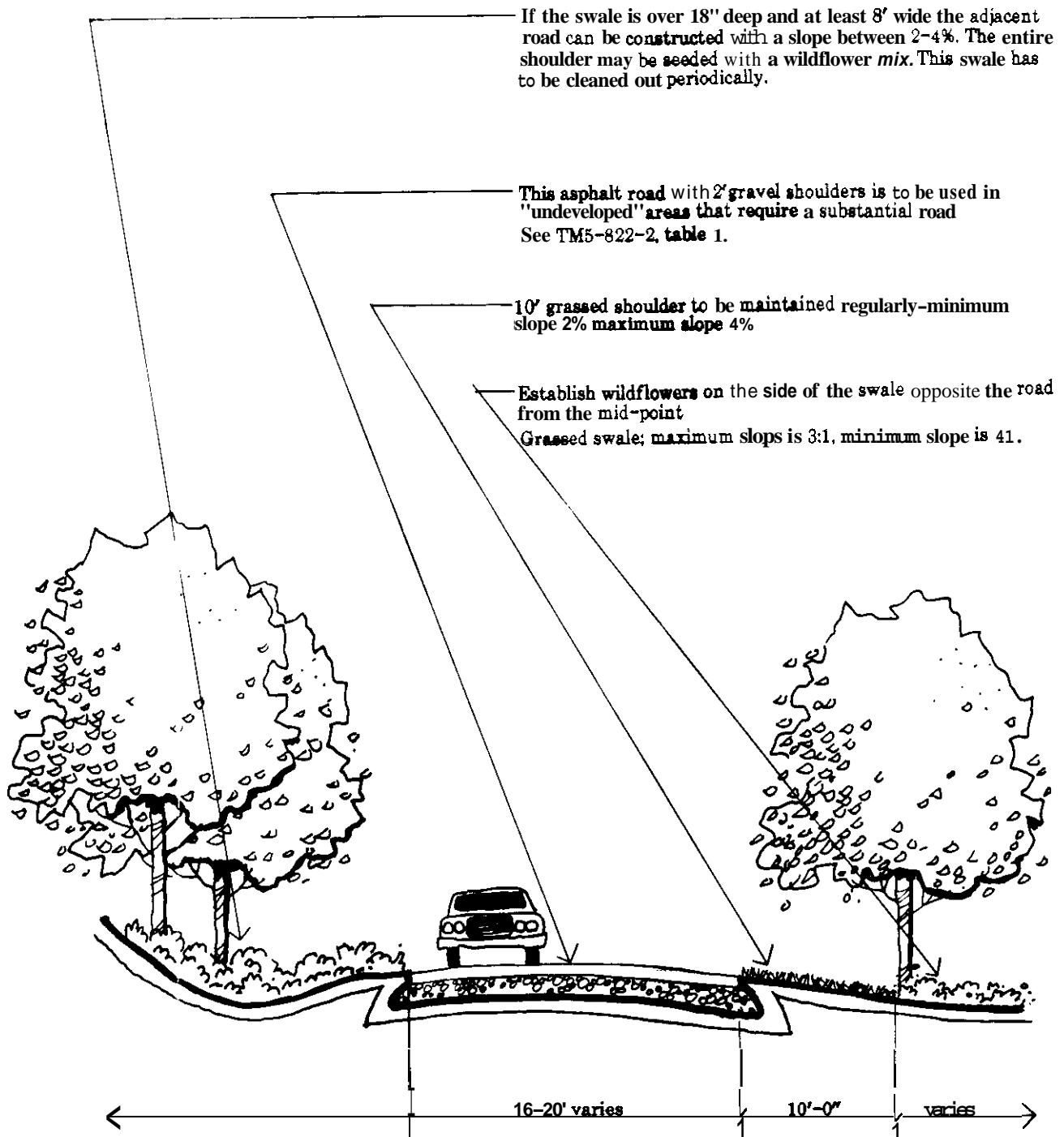
Rural Road



# ROADS & PATHS

## ROAD HIERARCHY

### Rural Road

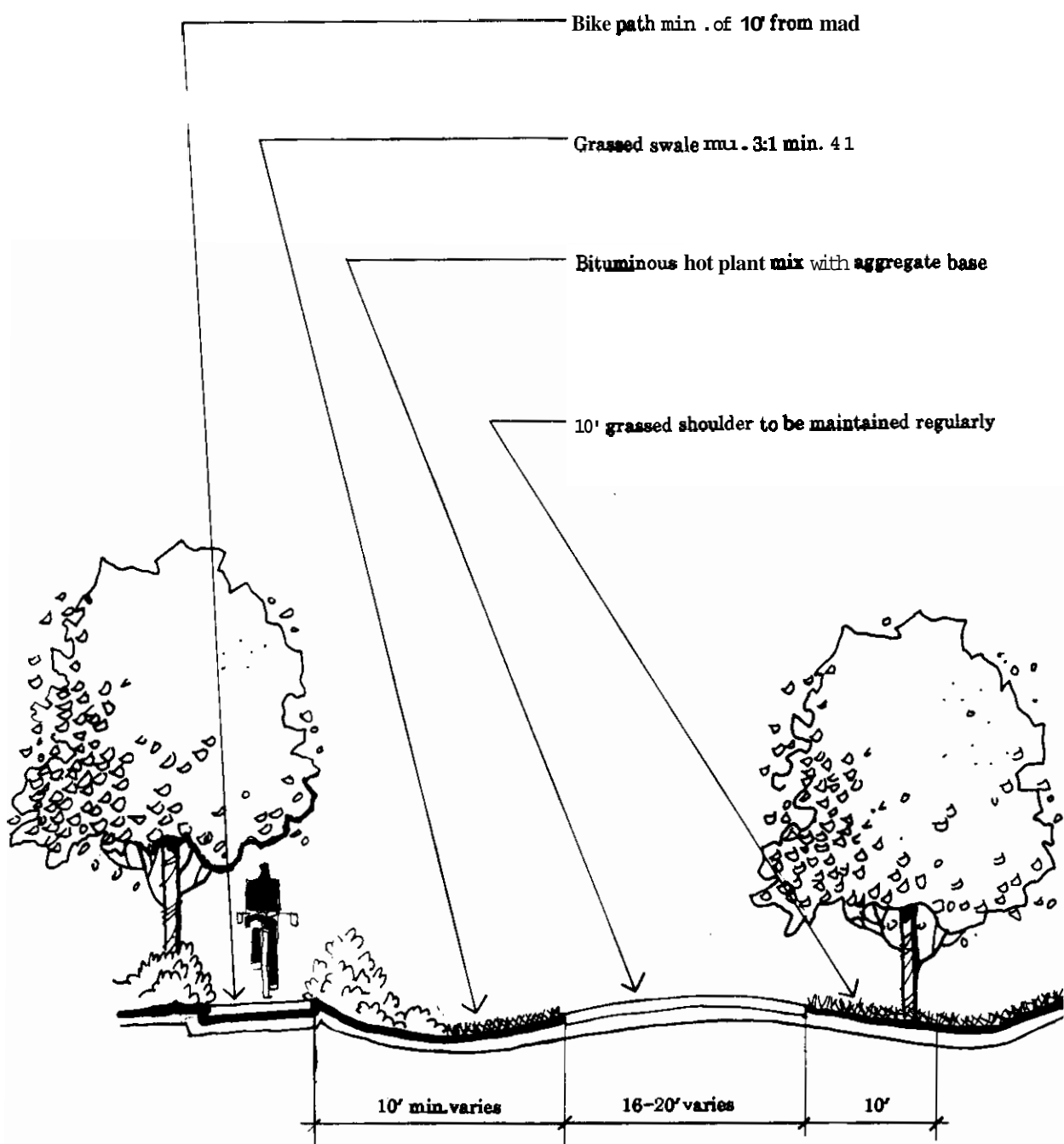




ROADS & PATHS

ROAD HIERARCHY

Rural Road



## ROADS & PATHS

### ALIGNMENT

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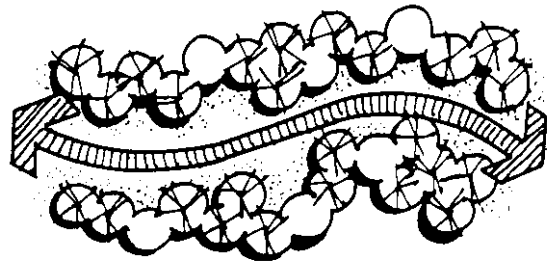
#### Alignment

Circulation systems are governed by two basic criteria, access and topography. The systems should be designed *to* go where people want to go and they should fit into the landscape. The systems (roads, walks and bike paths) should be designed to minimize cut and fill. All cut and fill slopes and drainage channels should be rounded *to* blend into the natural landform. They should be aligned to protect existing vegetation; wherever vegetation or ground is disturbed optimum conditions for revegetation should be provided - see sections **2.11.1** and **4.18.1**.

This road, walk or path has a straight alignment with uniform clearing and is monotonous.



This road, walk or path is aligned with the topography. The undulated clearing and feathered vegetation create an interesting path or road.



Pathway alignment



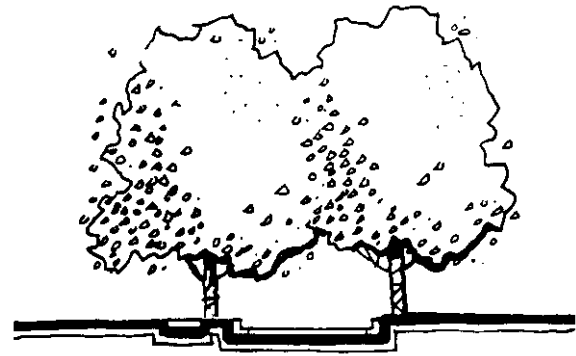
## ROADS & PATHS

### ROAD EXPANSION

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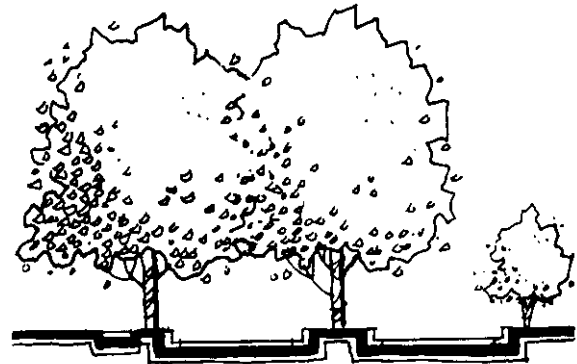
#### Road Expansion

When expanding streets it is not always necessary to destroy existing trees. Plan for future growth. The necessary median width will be determined by the size of the existing trees. The designer will consult an arborist before any major construction. The primary concern will be to prevent damage and/or death to existing trees and to maintain their health and vigor. Any measure the arborist advises will be undertaken.

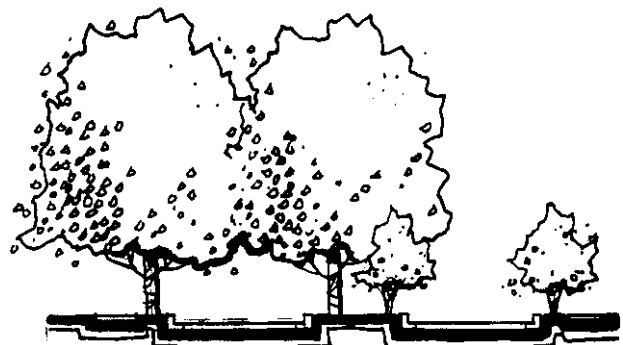


Existing street/trees

In the design of new roads, a minimum 2' future widening strip from back of curb is to be provided and is to be kept free from plantings.



Expanded divided street/double row of trees



Divided 4-lane/trees



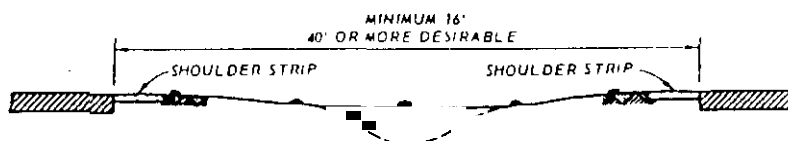
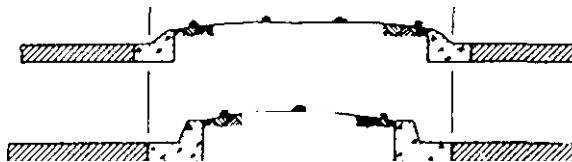
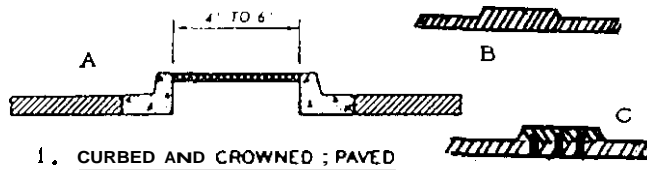
## ROADS & PATHS

### MEDIAN CROSS SECTIONS

#### Median Cross Sections

Curbs and paved median may be monolithic as in 1-B or may be surface-mounted on monolithic pavement as in 1-C. **If** surface-mounted, the curb-and-median slab must be anchored or bonded to the pavement (1-C).

All medians less than 10 feet wide should be designed with barrier curbs. **If** vegetation is to be maintained on median, or **if** snow removal will be required, the minimum width of median should be 10 feet. Separating guardrails will be installed in medians if justified by traffic conditions. This information is taken from TM 5-822-2..

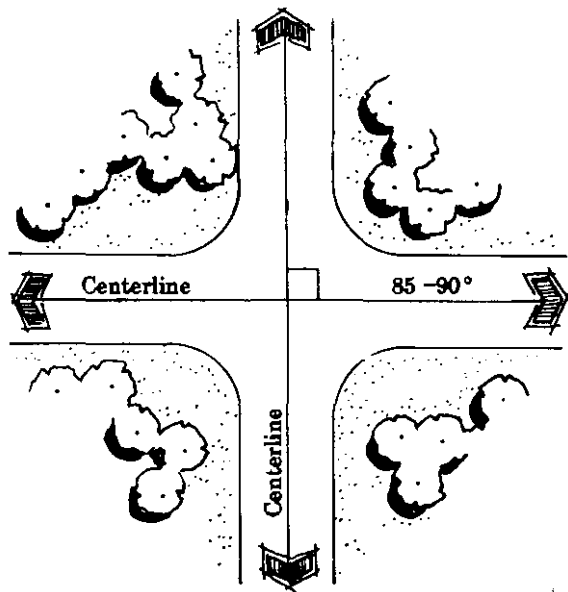


## ROADS & PATHS

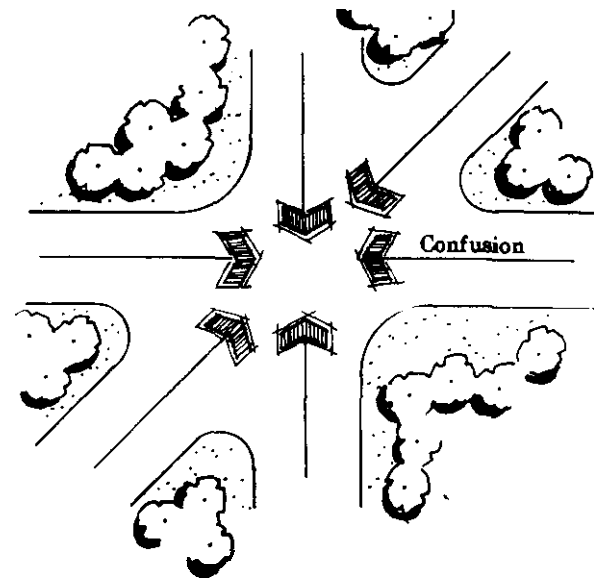
### INTERSECTIONS

#### Intersections

Intersections are the most crucial element in any circulation system. Proper alignment, sight distances, crosswalks and proper signage help to reduce accidents and improve circulation. The angle at which roads intersect is very important for safety. Roads should cross at right angles (90 degrees), although 85-95 degrees is acceptable. This standard should be used when designing new roads to realign existing intersections which do not conform to these standards.

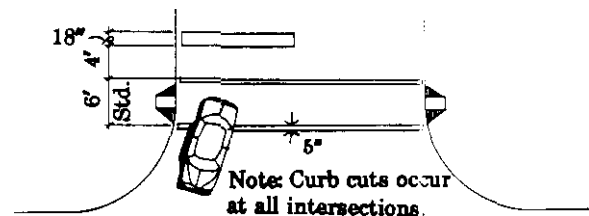


This



Not this

Intersections are to be marked with crosswalks. The stripes are reflective white and a standard five inches wide. They may be painted or taped. All roads with marked lanes will have the additional stop stripe for on-coming traffic, of same material as crosswalk. The stop stripe will be 4 feet from crosswalks and be 18 inches wide. Crosswalks are to be marked only in conjunction with established sidewalks.

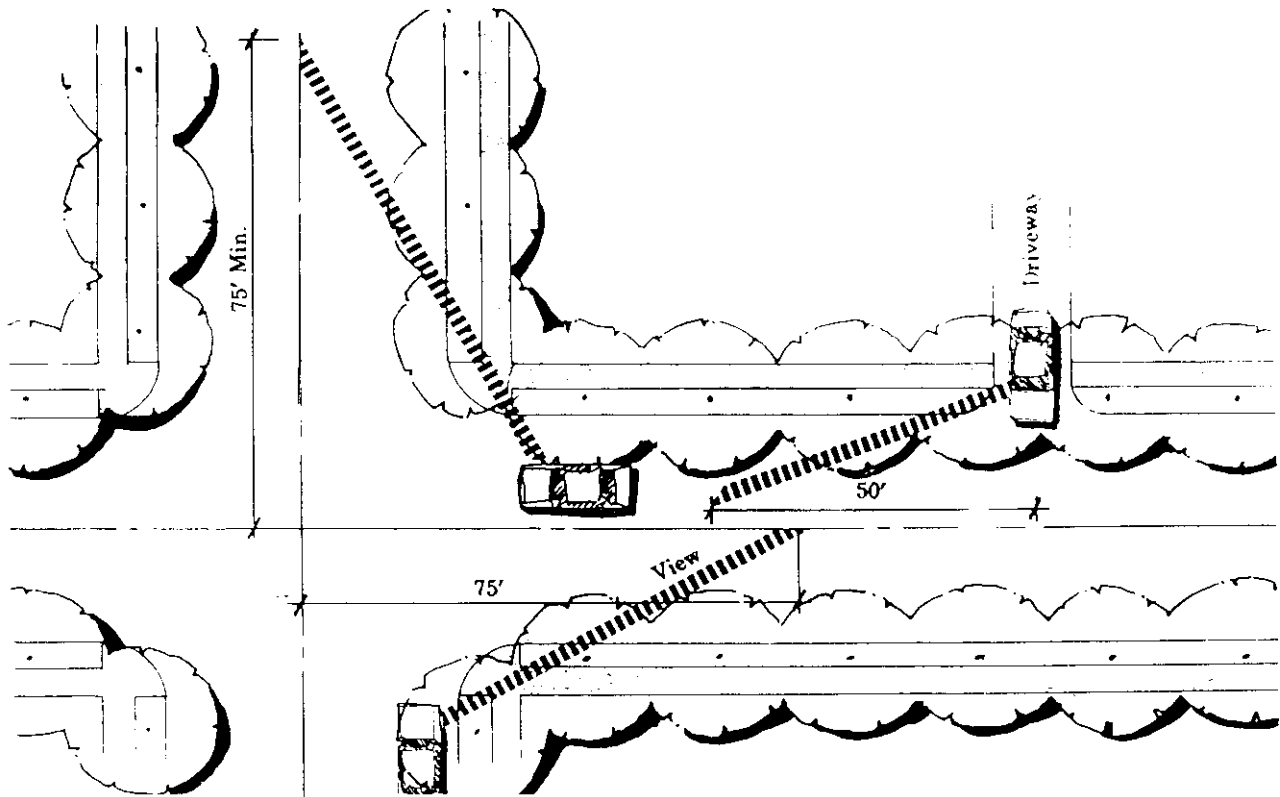


## ROADS & PATHS INTERSECTIONS

Field of vision at intersections will not be blocked by tree trunks. Street trees will be arranged to allow the driver at least a 75 foot view in both directions. At exits, trees along the street should be located far enough from the driveway to allow a driver to see at least 50' in both directions before entering the street.

All site furnishings, signs, utility poles, fire hydrants and light poles are to be located a minimum of 2 feet from the curb or edge of paving in any area where the design speed of the road is less than 40 mph and out of sight triangle.

On roads with a design speed greater than 41 mph, all site furnishings, fire hydrants, light poles shall be located a minimum of 12' from back of curb or edge of pavement. No utility or overhead wiring is permitted within 100 feet of the edge of pavement.



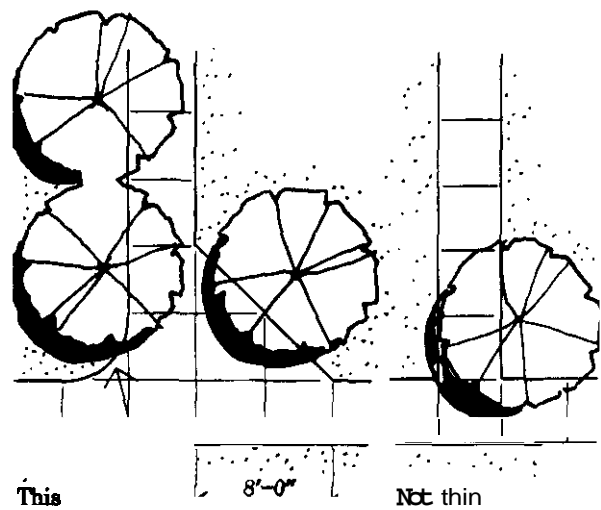
Intersection Sight Lines

Field of vision

ROADS & PATHS

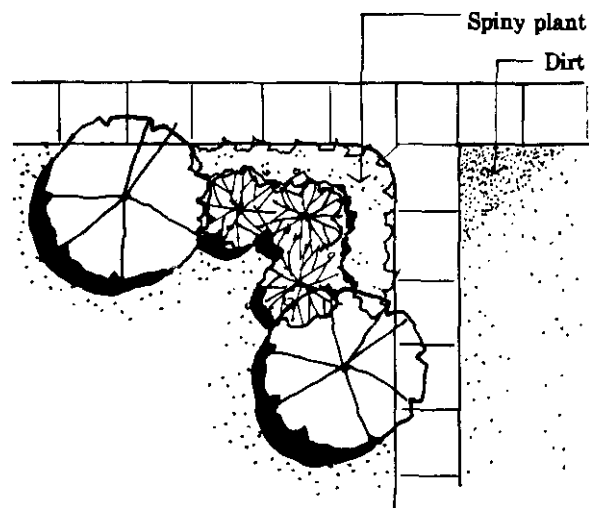
INTERSECTIONS

Walkway intersections may be curved or have a 45° angle. This will aid in eliminating the need for landscaped corners. Turf areas should be established and maintained at these intersections.



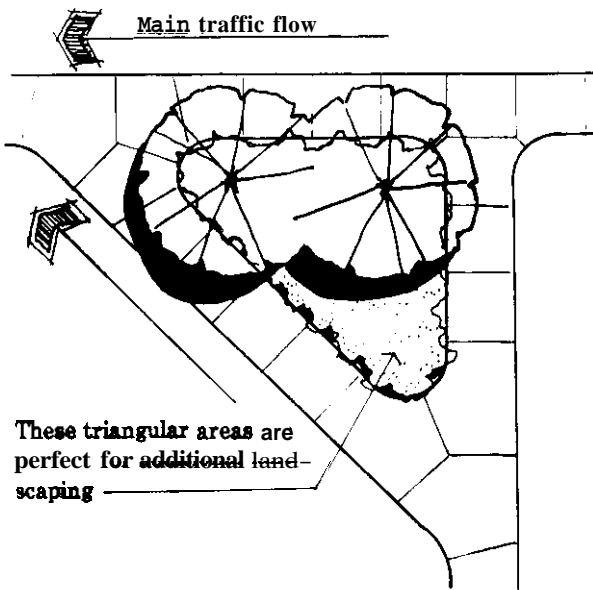
New walks are to have a 8' minimum radius.

In areas where grass cannot be established because of foot traffic – plantings, especially of spiny or thorny plants may encourage people to remain on the walk. The use of fencing or poles at walkway intersections is prohibited.

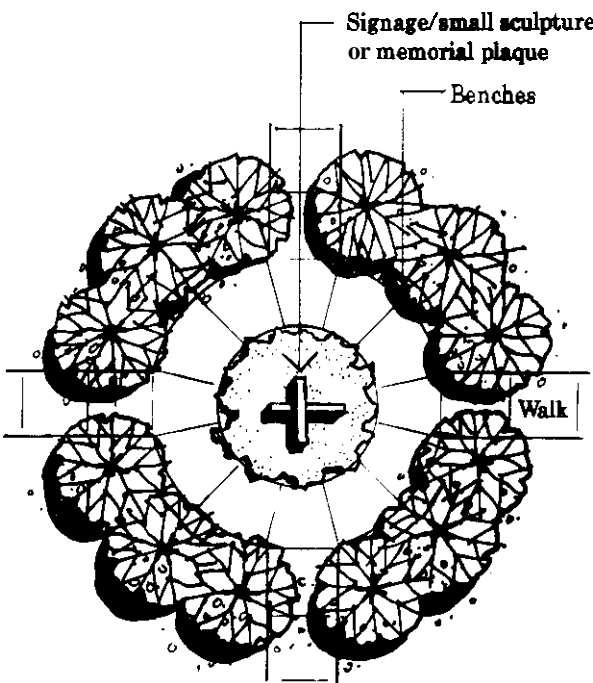


# ROADS & PATHS

## INTERSECTIONS



On primary or high use walks, a diagonal connector for users before the intersection is reached will help mitigate ugly intersections.



Provide visual interest along walks and at focal points through the use of landscape material.



## ROADS & PATHS

### SIDEWALKS

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#### General Information

Paths make up the pedestrian circulation system at Fort Jackson and have a great effect on the visual environment. The pedestrian circulation system should be flowing and undulating, providing a safe, convenient and interesting environment for the pedestrian traveling through the Post. The pedestrian circulation system should be designed as a network of interrelated spaces.

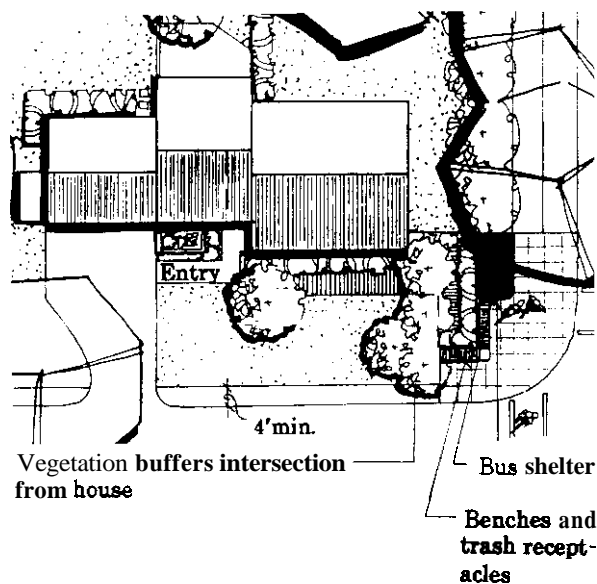
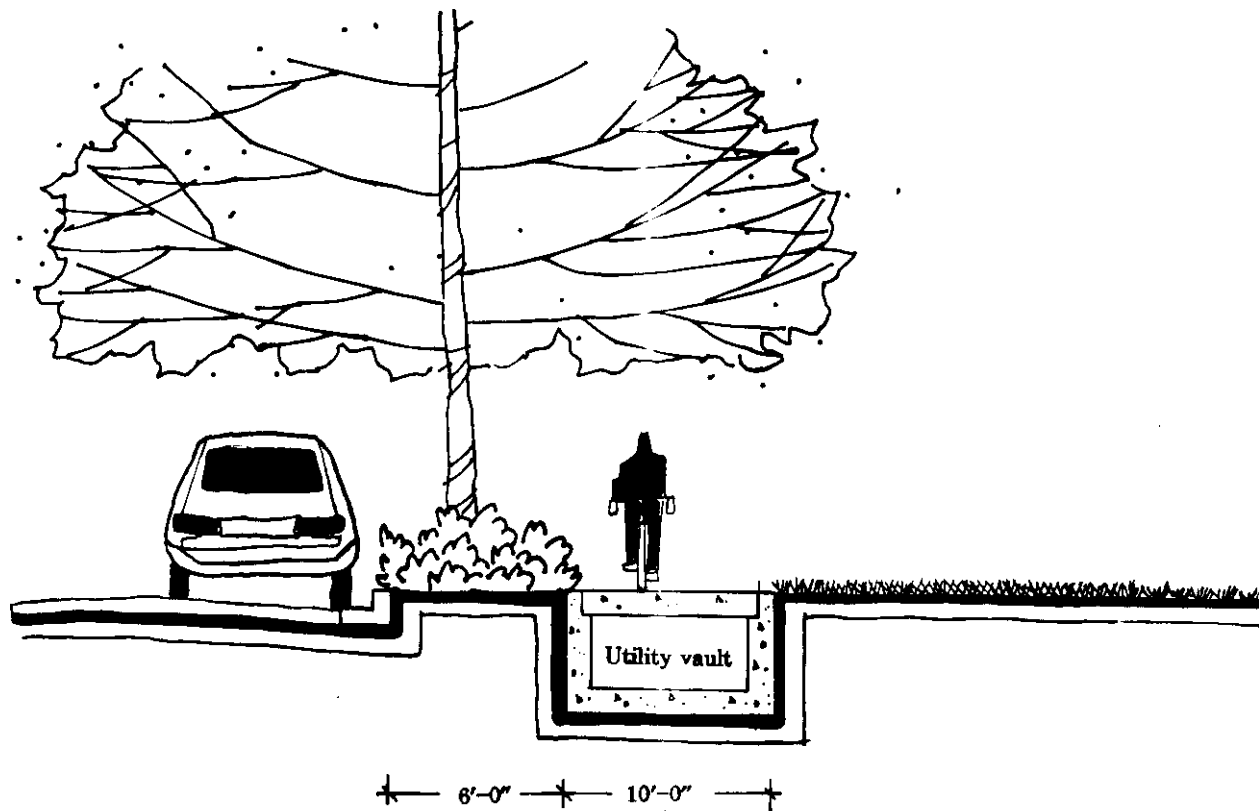
Paths act **as a** unifying element to the landscape, and relate buildings and function in a harmonious manner. Proper design, alignment and materials can create walkways that will aid in improving the visual environment. The following standards shall be implemented when developing a pedestrian circulation system throughout Post:

Walks in the administrative, community facilities and mission support zones will carry the highest volume of traffic. Generally, walks will be of concrete. At the designers discretion, brick pavers may be used. Major walks shall be a minimum of 10' wide. Minor sidewalks shall be wide enough to serve their purpose; but never less than 4' wide. Street trees shall separate the pedestrian from vehicular traffic offering both physical and psychological barriers. Walks do not have to be parallel to the street. See utility section for additional information about utility vaults under walkways.



## ROADS & PATHS

### SIDEWALKS



In the housing zone walks are only required on one side of the street because of generally low traffic volumes. Their preferred location will be on southern and western sides of the street. Areas around community mailboxes, bus shelters, and entrances to play areas will be paved. The minimum width of walks in this zone will be 4 foot. Entry walks should be designed when the house is designed. The entry should be gracious and inviting.

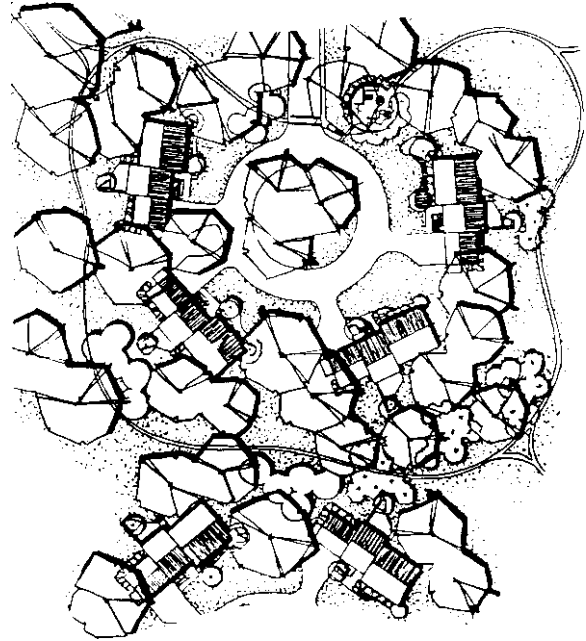


## ROADS & PATHS

### SIDEWALKS

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In situations where paths connect living units to each other and the tot lot, the paths shall serve both bikes and pedestrians, therefore they are to be a minimum of 6'-6". These paths do not have to be concrete, they may be asphalt or a soil and aggregate *mix* which is then compacted.



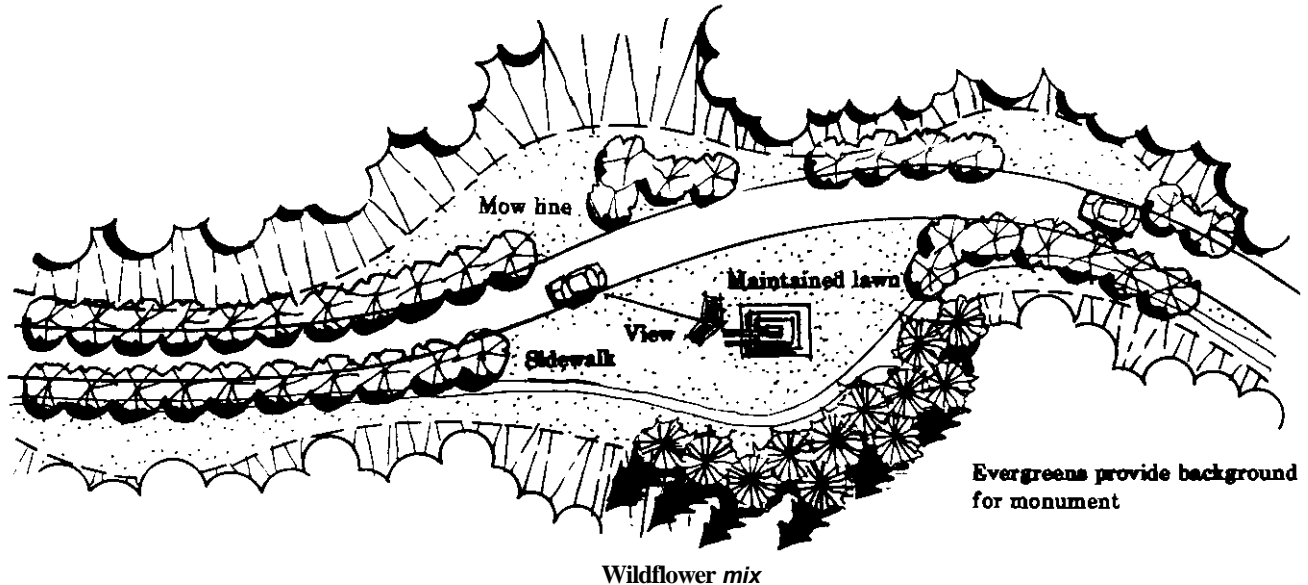
Walks in the industrial zone shall concentrate on the establishment of entries to main office buildings or headquarters. These entries should be designed with the building creating a pleasant transition between parking and entry. The entry walk shall never be less than 6' wide.

Due to low pedestrian traffic volume and the amount of paving in industrial areas, concrete sidewalks are not necessary, although the separation and delineation of pedestrian walks is recommended. This may be accomplished by striping with 5 inch bands of cream reflective paint. If additional protection is thought desirable by the designer the wooden bollard may be used to define paths — See plate 5.11.2. These paths should be 4 feet wide, minimum. (6' for handicapped access).



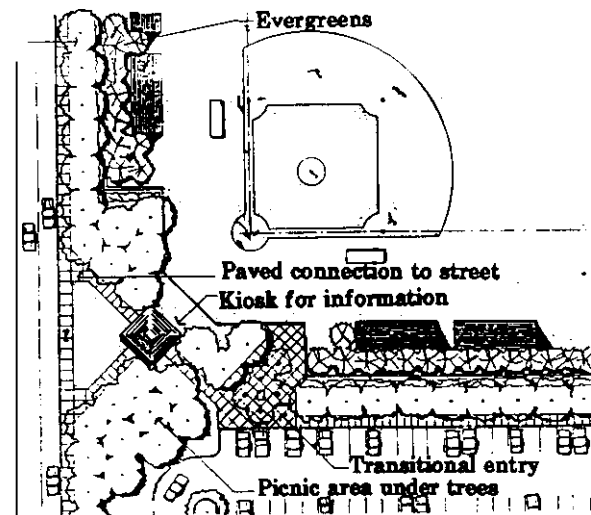
## ROADS & PATHS SIDEWALKS

In passive use areas a **4'** walk is adequate. If the walk is also a part of the bike or handicapped path system it should be a minimum of **6.5** feet. Asphalt walks with clearly defined edges are adequate.



Passive use area

In open space walk width should be determined by amount of use. In areas with high traffic volumes 10' walks will be required. They will be troweled and broom-finished concrete with appropriate expansion and construction joints.



Intensive/active use area



## ROADS & PATHS

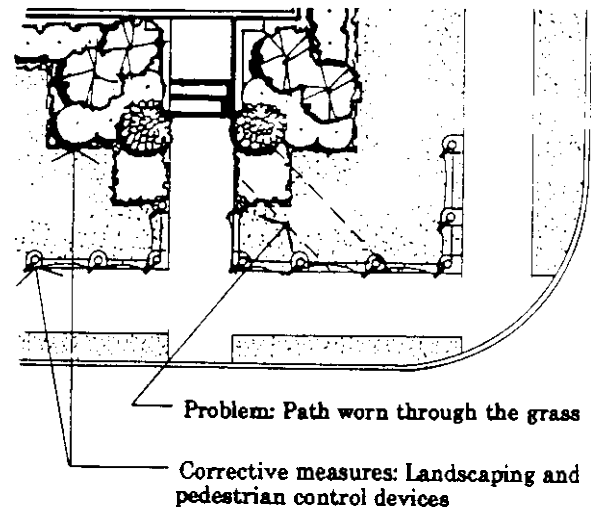
### SIDEWALKS

#### Sidewalks

The pedestrian circulation between a building entry and adjacent site features should be provided by interior walkways. They are the most direct connection between high density pedestrian spaces, but are physically separate from the roads.

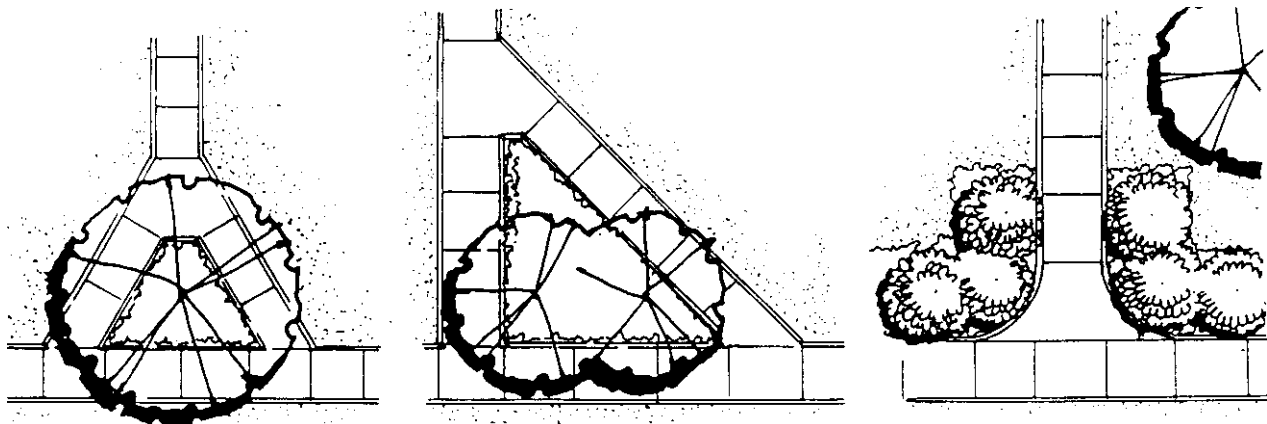
Walks must portray some order of movement or planned sequences in high use of high visibility locations such as path intersections or when a path meets a plaza, courtyard or entry.

Pedestrians often cut corners at sidewalk intersections, creating a worn area in the turf. This can be alleviated by using pedestrian control devices such as plant material, walls, landforms, or site furnishings.



Pedestrian control devices

Creating a planting island with walks flanking either side is another solution to this problem.

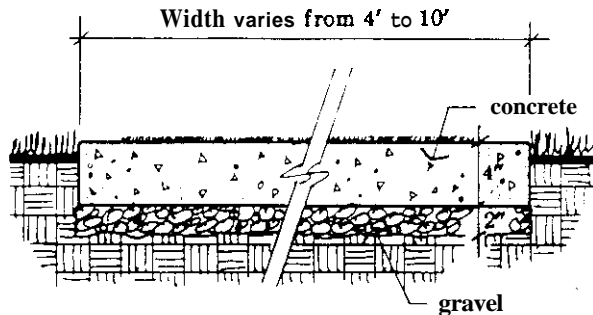


Path configurations



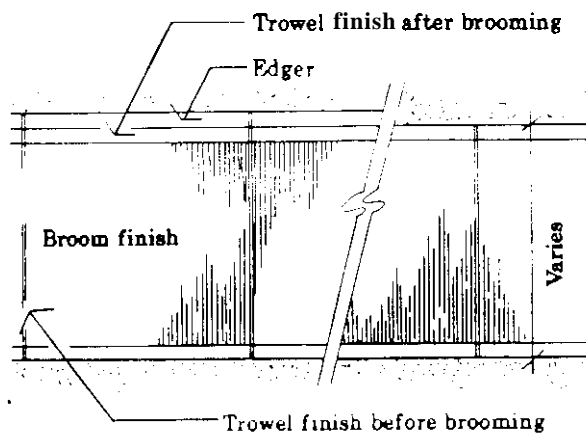
## ROADS & PATHS

### SIDEWALKS

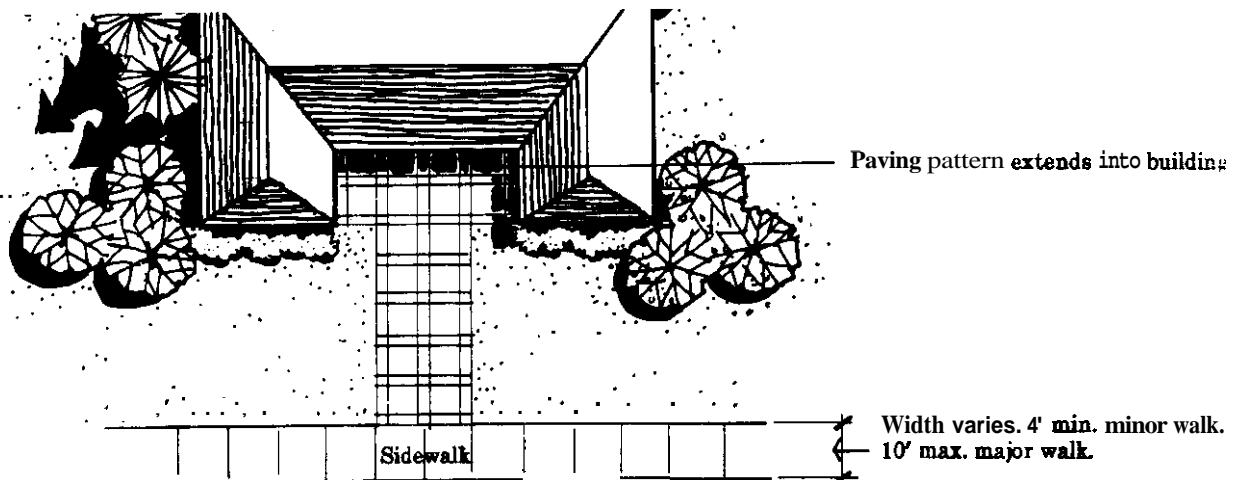


Section of sidewalk

Walks are to be troweled and broom-finished concrete with appropriate expansion and construction joints. Although concrete has a high installation cost, maintenance cost is low and concrete has a long economic life. Other surfaces selected by the designer, such as brick pavers, may be appropriate if a walk is built in conjunction with a building or plaza. The designer must be careful to select materials that relate to the post, and are permitted in these guidelines.



Plan of sidewalk

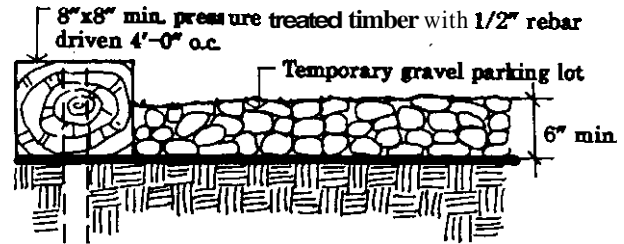


## ROADS & PATHS

### SIDEWALKS

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Occasionally, in remote low use areas a hard paving surface may not be economically feasible. In such cases, the use of a granular or composition material is acceptable. Such material is to be contained with pressure treated timber secured by steel spikes. These walks should positively drain to appropriate feature.



# ROADS & PATHS

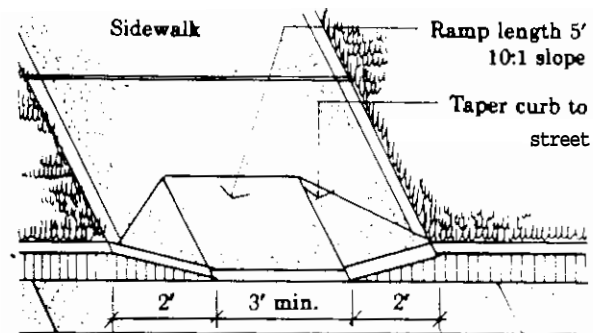
## RAMPS AND STEPS

### General Information

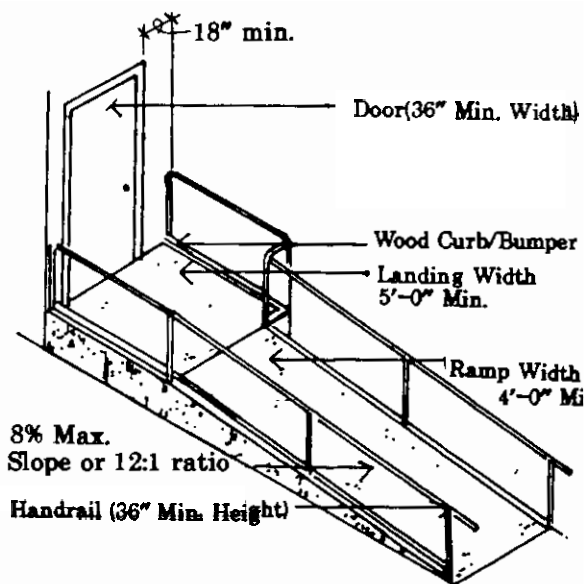
Ramps and steps attached to a building must be an integral part of the entry of the building. Materials, fenestration and railings must all relate to the architecture. All design criteria shall comply with DoD 4270.1-M.

### Ramps

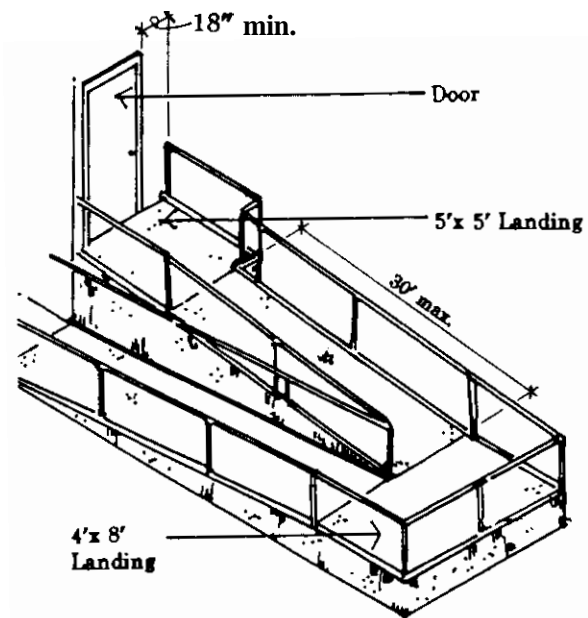
- Barrier free design shall be implemented throughout the Post. Where paths intersect the road, the curb level shall be dropped for unimpeded access.
- Ramps shall be tapered on both sides and the width shall equal that of the sidewalk and crosswalk.
- Provide access to facilities for handicapped persons. They require a significant horizontal dimension in relation to the change in elevation.



Drop curbs at intersections



Concrete ramp with rough textured non-slip surface



Double back ramp configuration; use if straight ramp would be impractical

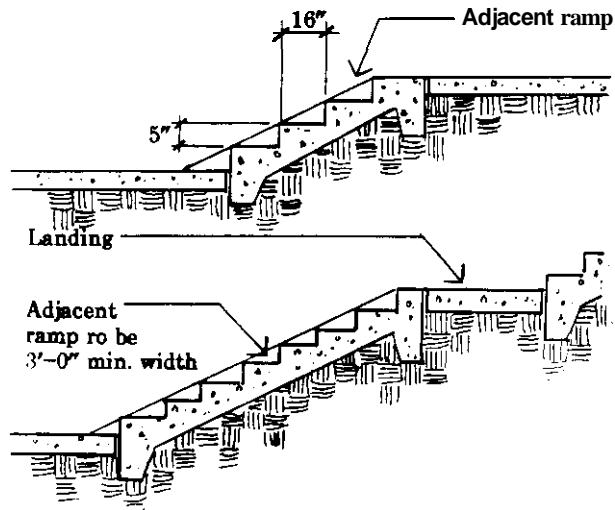




## ROADS & PATHS

### RAMPS AND STEPS

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#### Steps

- All exterior steps are to have a minimum width of 4'-0.
- All steps should have a uniform tread width of 16 and should not have risers greater than 6 .
- All steps should occur in pairs.
- If there are more than 9 risers, the steps shall be separated by a landing.
- Handrails for exterior steps shall be provided on both sides and should extend past the tread at the top and bottom of the steps.
- All exterior steps shall have an average level of illumination to ensure safe nighttime use. See Utilities and Lighting.

# ROADS & PATHS

## CROSSWALKS

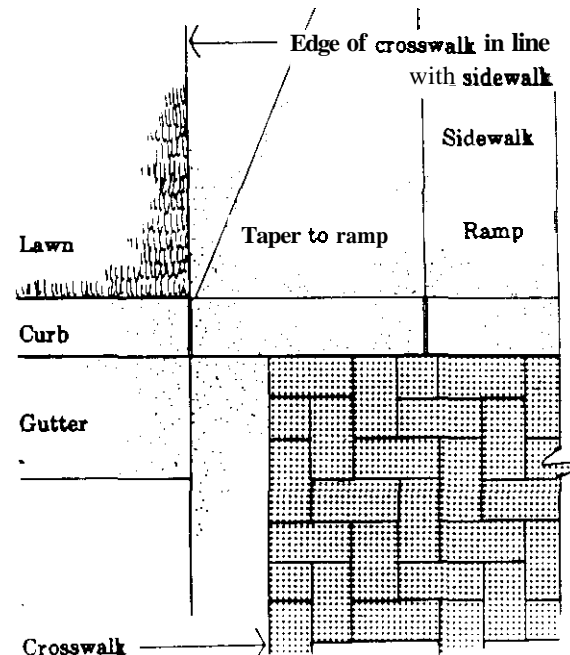
### Crosswalks

Crosswalks are a safety measure used to direct pedestrians to cross the streets at selected locations. The crosswalks must be clearly identifiable to both the pedestrian and vehicle operator. Curb cuts shall be provided **at** all crosswalks to allow for handicap accessibility.

Crosswalks on primary streets including high visibility areas at Fort Jackson shall be constructed of concrete pavers.

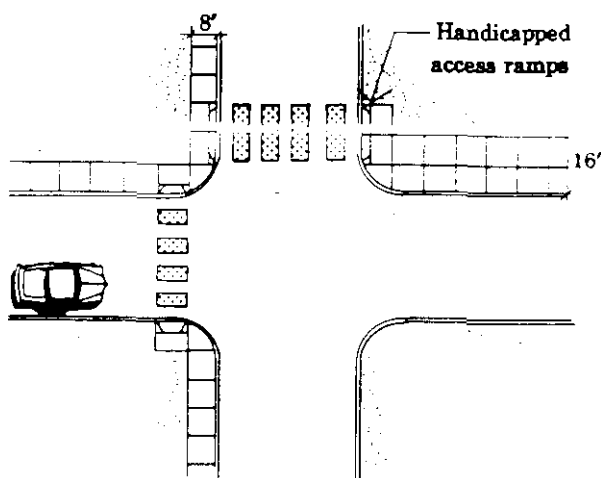
Crosswalk width shall be equal to the adjacent sidewalk width.

Crosswalks on all other streets shall be of painted white reflective paint or vinyl appliques manufactured for the purpose.

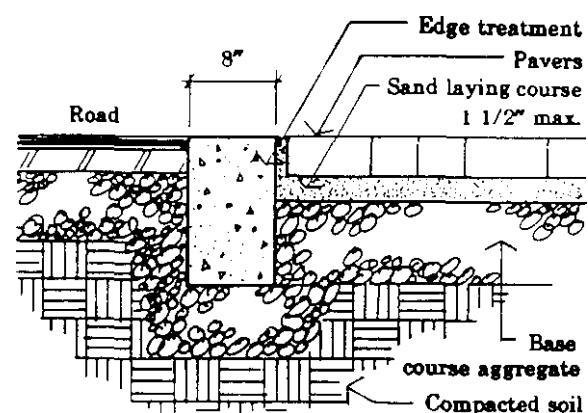


All vehicular traffic areas with pavers shall be laid in herring bone pattern

Plan of paved crosswalk



Crosswalk striping



Section of paved crosswalk



## **ROADS & PATHS**

### **BIKE PATH SYSTEM**

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The bicycle **as** a means of recreational and destination oriented travel should be considered at the Post. Bike travel should be encouraged to conserve energy, promote physical fitness and to reduce automobile congestion and parking requirements.

A bikeway system should provide direct routes between primary traffic origins and destinations within the installation. The network should be continuous to facilitate and encourage bike usage. Bikeway design should minimize potential conflicts between bikes, pedestrians and vehicular circulation and eliminate potential stationary hazards along its path.

In selecting a site for a bikeway, scenic beauty is of special significance in promoting its use by cyclists. Variety in terrain is a stimulant and challenge to riders and encourages repeat use, although it may increase construction costs. Insofar as possible, the bikeways should be designed to follow the contour of the land. Some elements that make a challenging ride are: a wooded area where safety factors are not a major concern; passing by high-use areas; an opportunity to increase the bike velocity in pedaling downhill combined with a chance to pedal harder in the cyclist's hill-climbing challenge; following a stream; circling a lake and crossing a well-designed and attractive bridge. In addition, features of a historic or scenic interest should not be forgotten in the bikeway's locations. The shortest distance to destination is not essential for this type of bike route. Also consider locating bikeways some distance away from high volume roads where possible and the "on-roadway" bike lanes on secondary and lightly used residential street within the Post.



## ROADS & PATHS

### BIKE PATH SYSTEM

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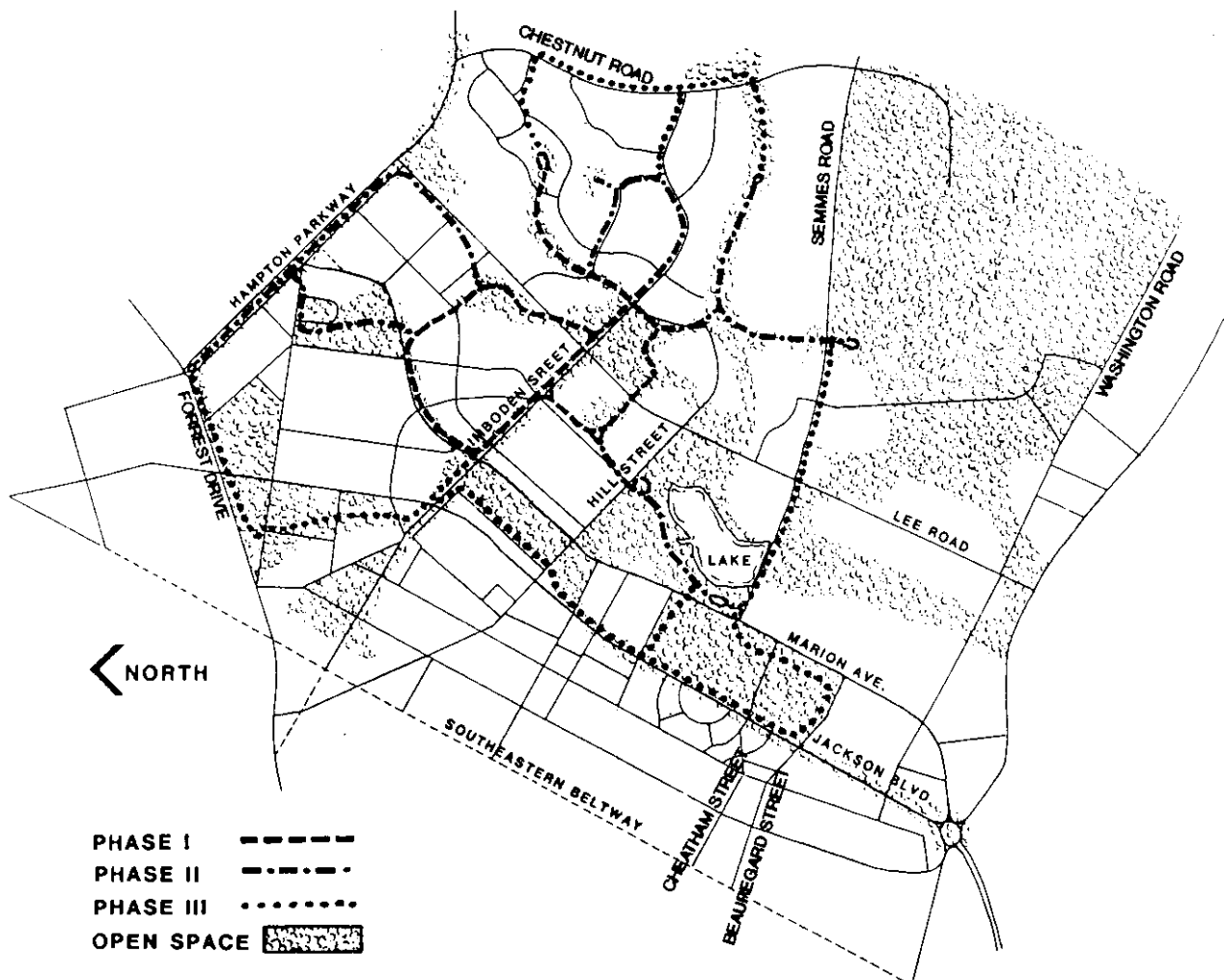
Before designing and constructing the bicycle movement and support facilities the following factors are to be considered.

- the cyclists and the potential cyclists and their needs in respect to facilities which will motivate their use;
- the terrain and general contour of land, which has bearing on minimum-maximum grades;
- o land-use compatibility with the immediate surroundings;
- o length and width of the paths, to properly handle the estimated numbers of users;
- o aesthetic values and points of interest;
- o design speed of bicycles;
- o road crossings where the bike path should cross at some distance from intersections to permit adequate motorist reaction time;
- o drainage
- radius of curvature for turns;
- provision of turn-around spots every mile on bikeways for maintenance stops;
- sign and lane markings;
- use of existing facilities where practical;
- o availability or necessity for providing bridges;
- o bicycle parking and storage
- o rest area equipment, concession facilities, and comfort stations;

## ROADS & PATHS

### BIKE PATH SYSTEM

This map represents a preliminary phased layout of bike paths at Fort Jackson. A thorough investigation of biking habits should be instituted before construction of bike paths begins. Bike paths should go to desired destinations. At Fort Jackson portions of the road systems provide suitable space for bike paths, especially if motorized traffic volumes are light. In areas where this traffic volume presents a safety hazard, sidewalks wide enough for bikes and pedestrians (see sheet 4) or a totally separate bike path may be installed if bike traffic volumes are high enough to justify this expense.

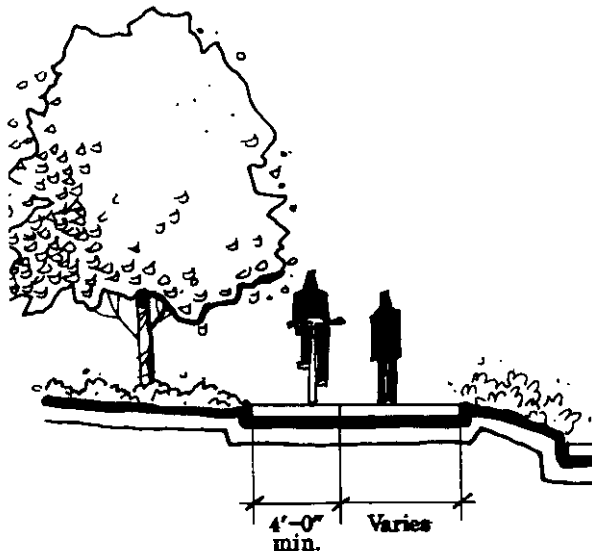


## ROADS & PATHS

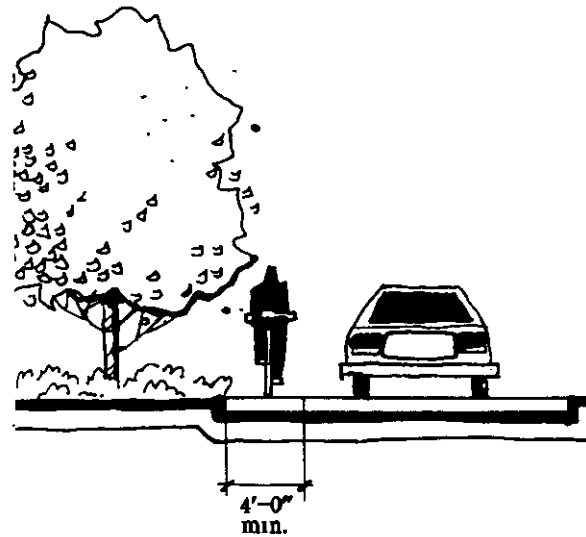
### BIKE PATH SYSTEM

The bike traffic volume at Fort Jackson is moderate to light, therefore a class III bikeway is appropriate. In this category the right-of-way is shared with either pedestrians or motor vehicles. If positive separation between cyclists and vehicles and/or pedestrians is deemed necessary a continuous or intermittent curb may be installed.

Note: If a bikeway is constructed by itself, it will have a minimum width of 4 feet with 6 foot 6 inches being desirable. This is the recommended width for 2-way traffic.



**Class III: Bikeway/walk**



**Class III: Bikeway/road**

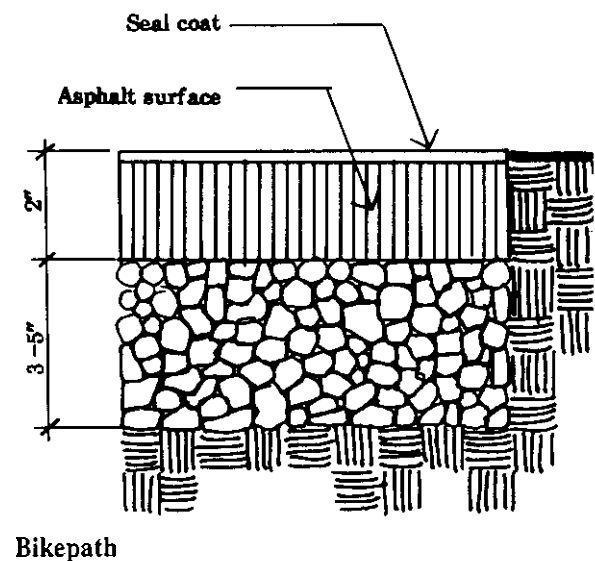
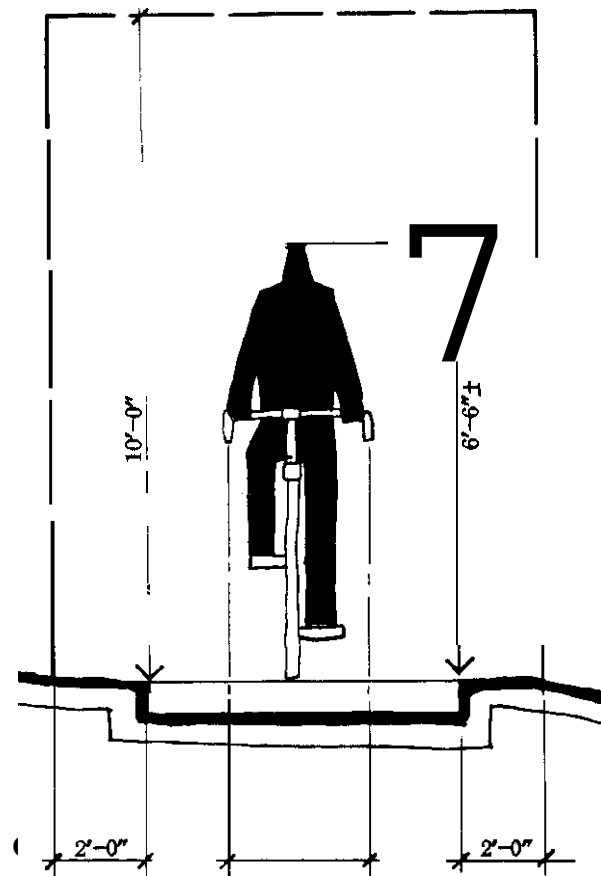


## ROADS & PATHS

### BIKE PATH SYSTEM

Provide space for the cyclist based upon the dimensions to the right. Shrubs bordering the paths should be cut back at least three feet from the bike path edge so that annual growth will not encroach on the path. Prune low tree branches over-hanging or bordering the path to a height of ten feet to permit cyclist passage as well as access for maintenance vehicles. 2-foot horizontal distance is required from the edges of the path to any object or grade change.

All bicycle paths must be constructed on a well drained sub-grade or sub-base to prevent setting or heaving through frost action.

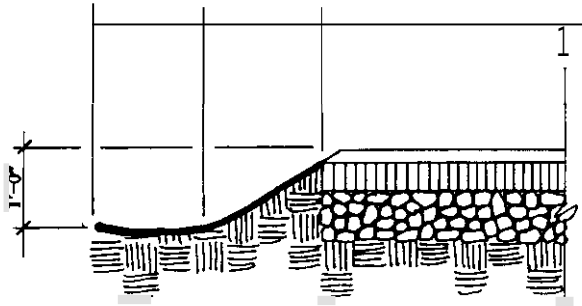


## ROADS & PATHS

### BIKE PATH SYSTEM

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Proper drainage, to insure that surface water will not accumulate and wash out sections of the bikeway or in any way hinder riders, is essential. Water must be removed under the path so that it will not freeze during the winter, causing heaving and buckling.



ing grade. From path to grassed channel the slope should not exceed 2:1.

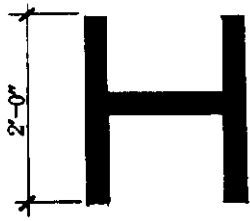




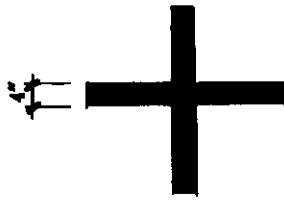
## ROADS & PATHS

### BIKE PATH SYSTEM

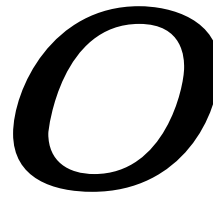
Signs will be erected or installed at each point requiring a decision by the cyclist. Warning signs should occur approximately 50 to 65 feet in advance of safety hazard situations. Mounted signs should be kept to a minimum because of the visual clutter that may result; and also these signs are susceptible to vandalism. Therefore pavement markings are more appropriate. Permitted symbols follow:



HAZARD

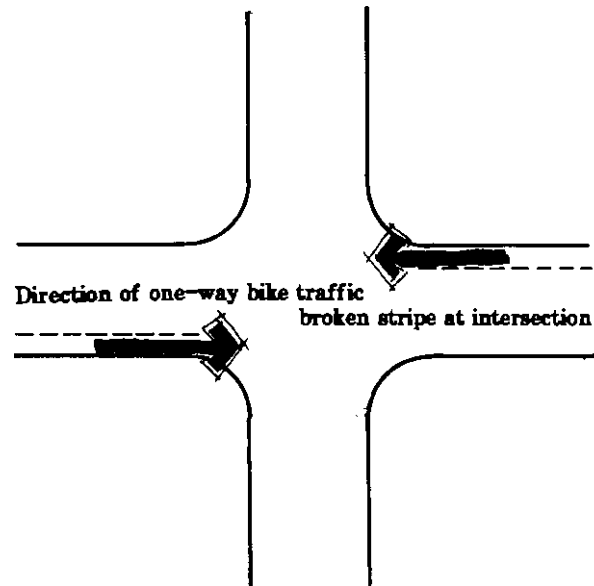


INTERSECTION



STOP

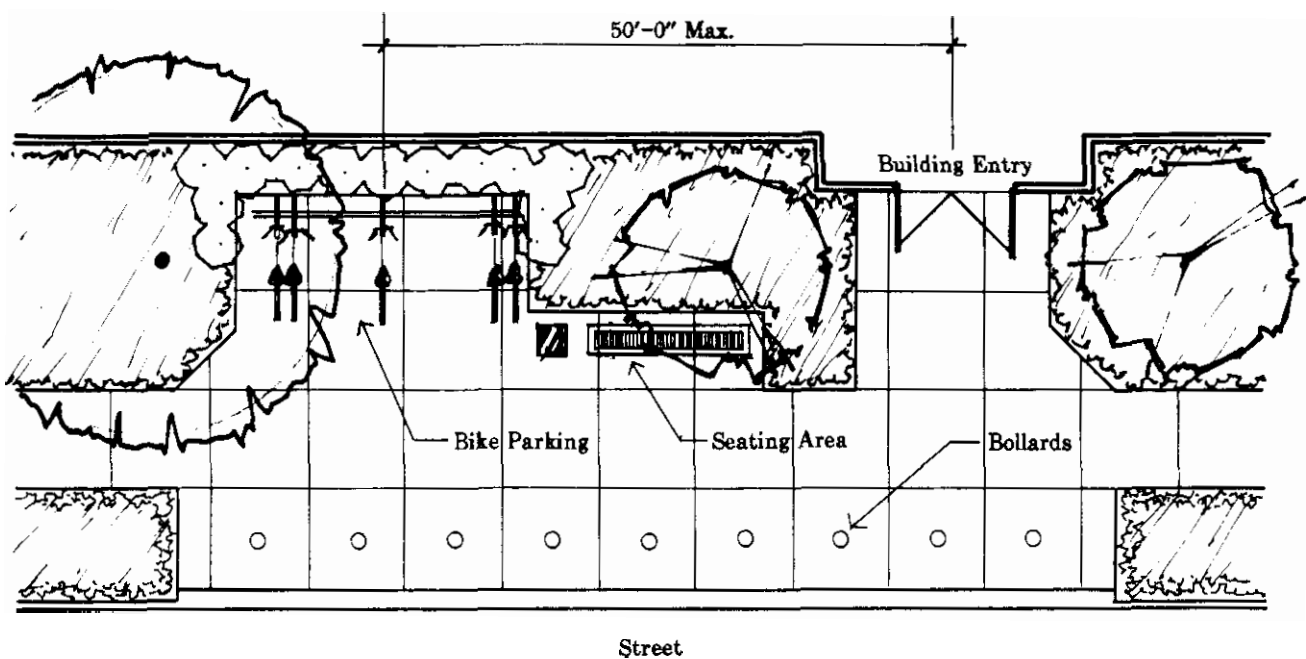
Mounted signs will conform with signing standards. See Section 6. Bike path signs will have a brown background with tan letters — see page 6.1.1 Sheet 2/2 Table 2-1 for standard colors. Tan should be a reflective paint. Lane markings inform both the cyclist and the motorist of their respective lanes. The lane designation should be marked with a continuous tan reflective stripe, 4" (inches) wide. For safety, intersections may be done as shown.



## ROADS & PATHS

### BIKE PATH SYSTEM

Locate bike parking areas out of pedestrian pathways but in areas which are visually supervised, if possible. The parking areas should be near the cyclist's destination, preferably within 50 feet of main entrances.



## ROADS & PATHS

### BANK STABILIZATION

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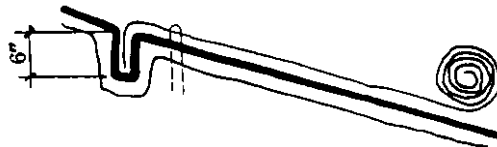
#### Bank Stabilization

When circulation systems are installed and ground is disturbed, the ground disturbed is to be revegetated as quickly as possible. Sodding, matting, hydroseeding, and reforestation are suitable ways of establishing a vegetative cover.

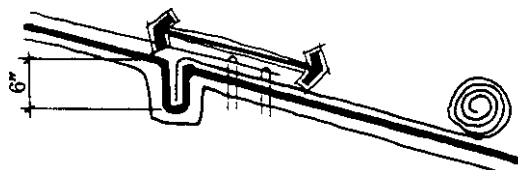
Sodding gives the fastest possible protection by vegetation. It is an expensive operation and should be applied to critical areas only. Sod can be placed at any time of the year provided that soil moisture is adequate and the ground is not frozen.

The purpose of matting plastic netting, burlap or wood excelsior is to stabilize the surface of the soil and to prevent erosion during the establishment of vegetation. This method is less expensive than most other stabilization techniques. Matting should be laid parallel to the slope or direction of run off, as specified by manufacturer's installation instructions.

Uphill ends should be buried in a 6" deep slot and stapled on 12" centers across width of the mat.



At joints the downhill end should be overlapped with the uphill end of the new roll which is inserted in a 6" slot and stapled on 12" centers.

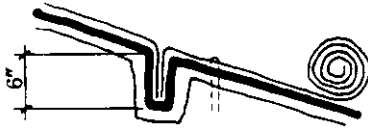


## ROADS & PATHS

### BANK STABILIZATION

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On very severe slopes check slots should be used. These are 6" deep slots into which a tight fold of matting is inserted. The slot is filled and tamped and staples inserted on 12" centers down slope of the check slot.



See section **4.18.1** for information concerning erosion control through rip-rapping and hydroseeding and section **4.13.1** for information about reforestation.

## PARKING

### DESIGN OBJECTIVES

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#### Design Objectives

The design of parking areas is often done as an afterthought to the design of various facilities. Demands for additional space are constant. Accommodations for parking, inherently an unattractive space, are to be planned **as** part of the entire design to minimize the negative appearance of these vehicle storage areas. The objectives for establishing a planned parking system throughout the Post are twofold. First, the visual impact of parking areas is to be minimized in the design of new and the renovation of existing lots. Second, through design and master planning, as well as by official policy the land area required for parking is to be minimized.



## PARKING

### GENERAL CRITERIA

The following table lists the official required number or amount of spaces for nonorganizational vehicles as listed in AEI Design Criteria 9 December, 1991.

FACILITY	NUMBER OF PARKING SPACES
Administration, Headquarters and Office Buildings	60% of assigned personnel
Fire Stations 3 Stall 7 Stall	7 spaces 10 spaces
Guard Houses, Brigs, Military Police Stations	30% of guard strength
Cafeteria, Civilian, when not Included in Community Shopping Center	15% of seating capacity (1 space/7 seats)
Chapels	30% of seating capacity
Commissary Stores, Food Sales, when not included in Community Shopping Center	2.5% of authorized customers served. (3 spaces/1,000 SF of gross floor space)
Community Shopping Center, including such elements as Main Exchange, Miscellaneous Shops, Restaurant, Commissary Sales Store, Bank, Theater, Post Office	2.5% of authorized customers served (4 spaces/1,000 SF of gross sales area or 1 space/6 seats)
Exchanges, Main, when not included in Community Shopping Center	2% of authorized customers served (3 spaces/1,000 SF of gross floor space)
Libraries  Central Branch	1 space for each 500 SF of floor space 8 spaces
Schools, Dependents  Without Auditorium With Auditorium	2 spaces per classroom 2 spaces per classroom, plus 15% of auditorium seats



## PARKING

### GENERAL CRITERIA

FACILITY	NUMBER OF PARKING SPACES
Dental Clinic (both separate and as part of another facility such as a hospital)	3 spaces per operating rm.
Hospitals and Dispensaries (Clinics")  $X1 = \frac{.59 \times 1}{.19 \times 2} \text{ spaces, where:}$ $X1 = \text{all personnel working within the facility on a continual basis}$ $X2 = \text{average daily outpatient load for the peak month}$	
The formula given is applicable only where there are no quarters for staff or patients within walking distance, where there is no public transportation system serving the facility. where there is no military shuttle system and where car-pooling is not practical. To the extent that any of the above conditions do exist, the X1 and X2 values will be reduced appropriately to reflect these other means of arrival at the facility.	
Service Clubs	2% of enlisted strength served (1 space/6 seats)
Swimming Pools	20% of design capacity of pool
Theaters, when not included in Community Shopping Center	25% of seating capacity (1 space/4 seats)
Gymnasiums (if only one at an installation)	1% of military strength served
Area Gymnasium (e.g., regimental)	10 spaces
Field House, combined with Football, Baseball and other outdoor recreation facilities	1% of military strength
Facility	Number of Spaces
Family Quarters	2 spaces per living unit
Temporary Lodging Facilities	100% of bedrooms

## PARKING

### GENERAL CRITERIA

FACILITY	NUMBER OF PARKING SPACES
Warehouses	1 space for each 500 SF office area, plus 1 space for each 4 persons assigned to storage activities
Maintenance Shops	38% of assigned personnel, largest shift
Laundries and Dry Cleaning Plants	38% of civilian employees, largest shift
Bakeries	38% of civilian employees, largest shift
Mission Support	
Barracks and Dormitories	60% of peacetime design capacity
Bachelor Officer's Quarters	90% of occupants' suites
Enlisting Personnel Dining Facilities for:	
Basic and/or recruit training, advanced individual training, service schools, recruit reception stations	38% of military and civilian food service operating personnel, largest shift
Permanent party, garrison (including Army TOE and TDA units) air installations (stations), support units, construction battalions, shipyards, weapon plants, personnel transfer and overseas processing centers	38% of military and civilian food service operating personnel, largest shift, plus 8% of enlisted personnel (patron parking) to be served
Central Food Preparation Facilities	38% of military and civilian food service operating personnel, largest shift



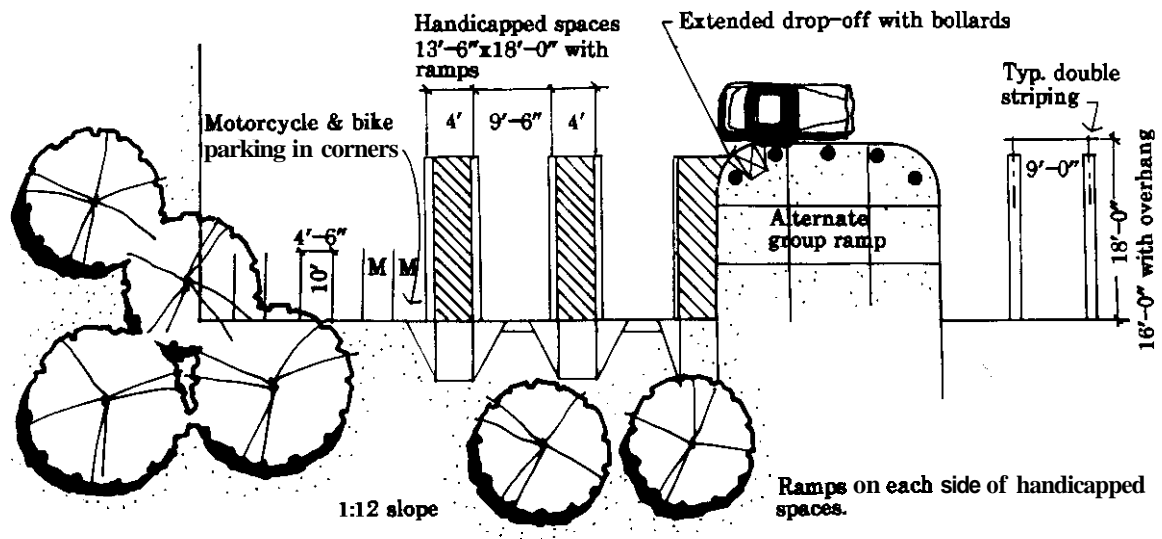


## PARKING

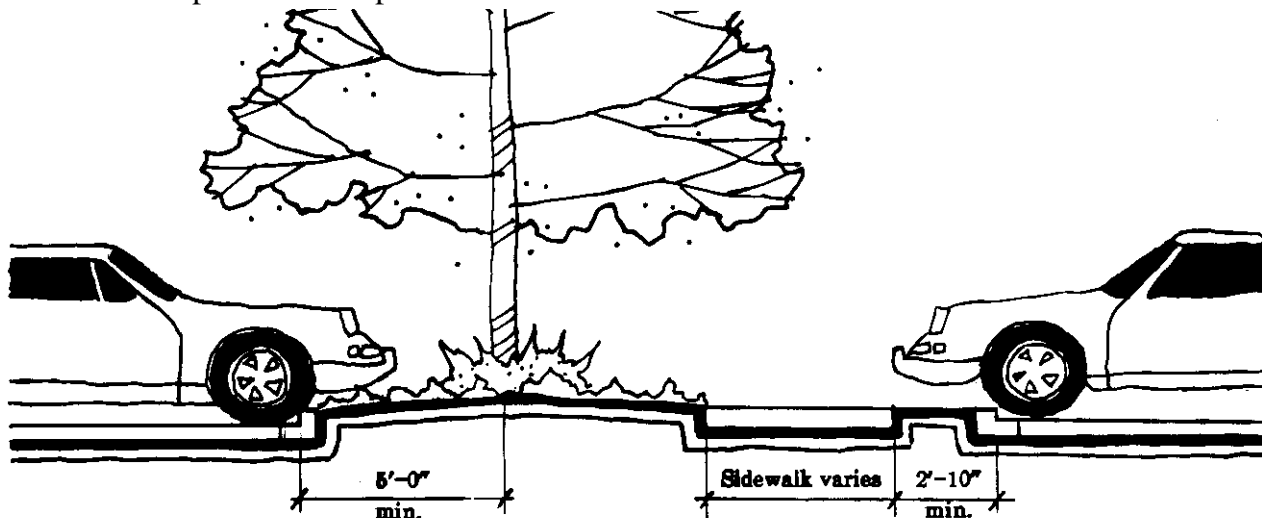
### GENERAL INFORMATION

#### General Information

Stall dimensions will be **9 x 16** feet where overhang occurs, and **9 x 18** feet without overhang. Aisles and access lanes will be **24** feet wide. Planting islands for 90 degree parking, where required, will be **12 x 36** feet. Handicapped spaces will be a minimum of **13'-6" x 18** feet and include a ramp or other means of access to the pedestrian circulation system.



Parking **lots** are to be located to take advantage of shared relationships such as with a chapel and school, or an office building and service club wherever practical. The grouping of facilities of shared use patterns is expected.



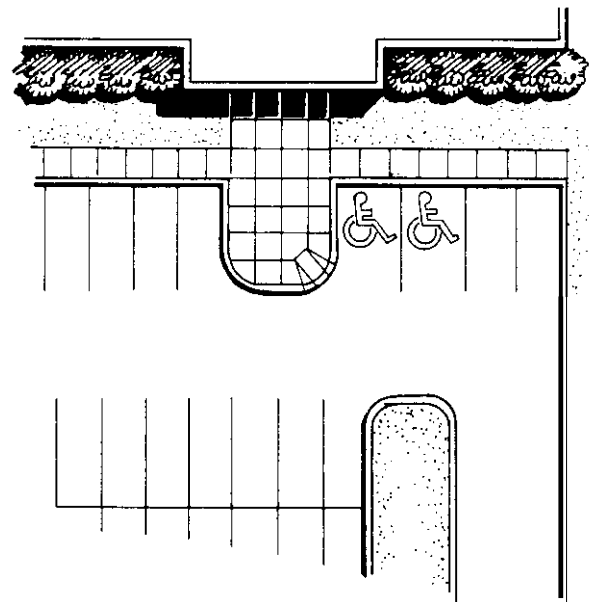
## PARKING HANDICAP ACCESS

### Handicap Access

The Post shall provide handicap access around all public buildings. This should include reserved parking near entrances and ramps to allow wheelchairs to make the necessary grade changes over curbs and steps.

The following criteria shall be used to establish the design and number of handicapped spaces required.

Total Parking in Lot	Required Minimum Number of Handicapped Accessible Spaces
1 to 25	1
26 to 50	2
51 to 75	3
76 to 100	4
101 to 150	5
151 to 200	6
201 to 300	7
301 to 400	8
401 to 500	9
501 to 1000	2% of Total



Typical handicapped space layout



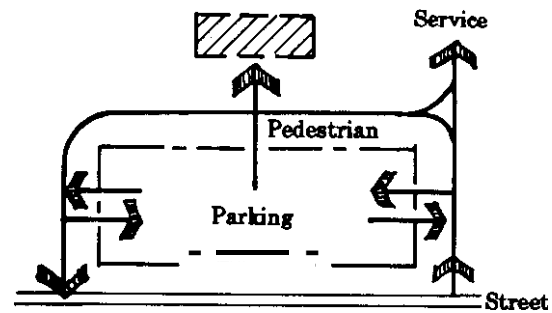
# PARKING

## CIRCULATION AND LAYOUT

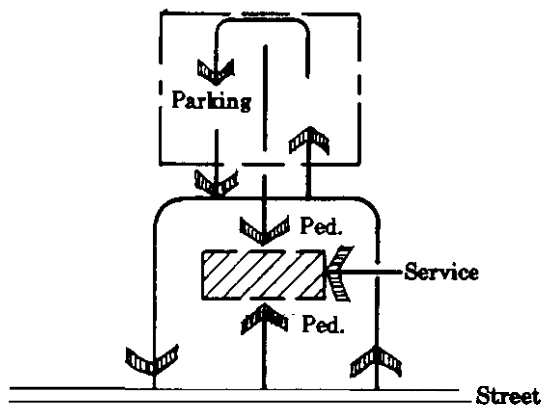
### Parking Lot Locations

Parking lot location is of great importance to the functional and aesthetic aspects of the buildings they serve. The transition from street to building entrance helps form first impressions for users approaching the building by automobile.

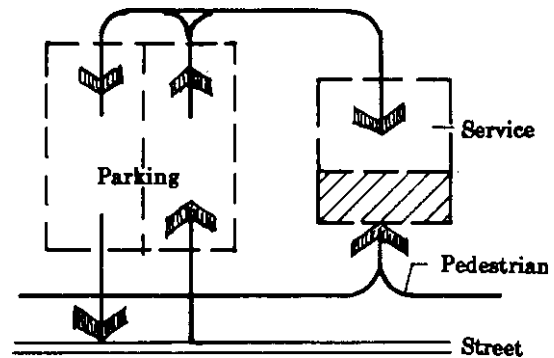
Parking areas will generally be located to the rear and sides of buildings when space permits. Visitor parking is to be provided in close proximity to the primary entrance of the building. When side or rear parking sites are not practical, as in community service facilities, the parking shall not block the view of, or the area directly in front of the main entrance. Drop-off areas should be considered for all large buildings. Other buildings such as medical or child care facilities may also require drop-off areas.



Parking at building front



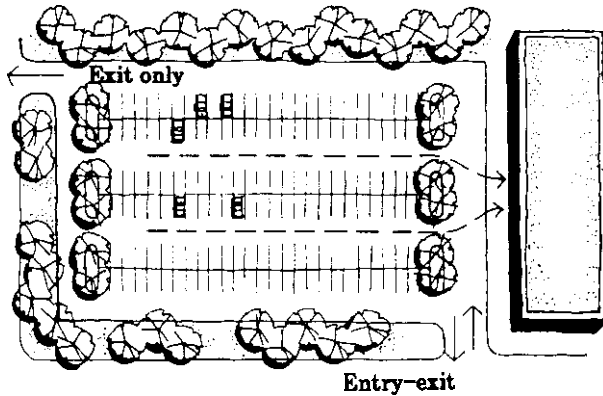
Parking at rear



Parking at side



## PARKING CIRCULATION AND LAYOUT

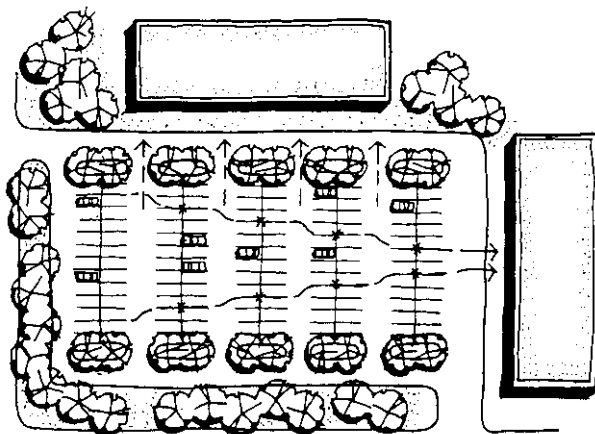


Avoid pedestrian movement through parked cars.

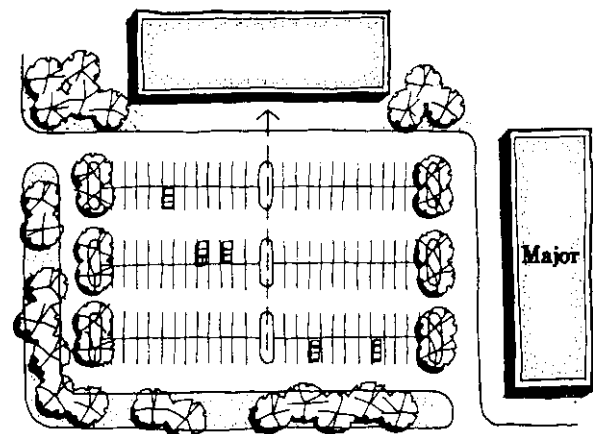
### Pedestrian Circulation

Generally, the preferred parking lot orientation for pedestrian circulation is to have parking bays parallel to the pedestrian circulation flow. This minimizes pedestrian flow across lanes of traffic.

When pedestrian flow must be perpendicular to bays, provisions for easy pedestrian circulation across bays shall be provided. Islands are necessary to accommodate pedestrian traffic towards building entrances and provide necessary hand-icapped access.



Provide cross-compound walkways where needed.



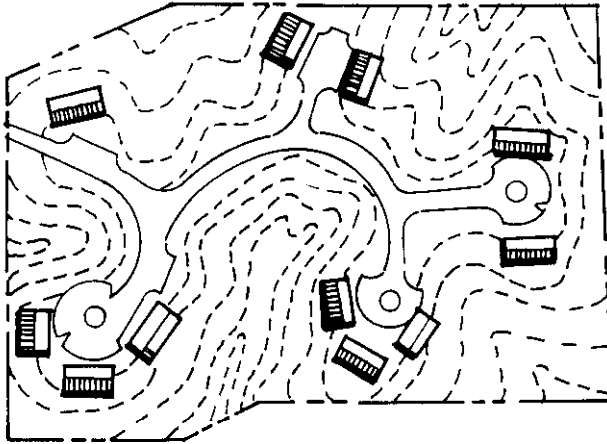
Align the parking aisles toward the major destination.



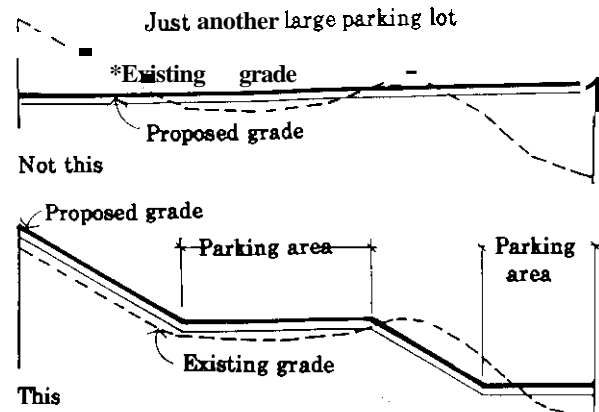
# PARKING

## CIRCULATION AND LAYOUT

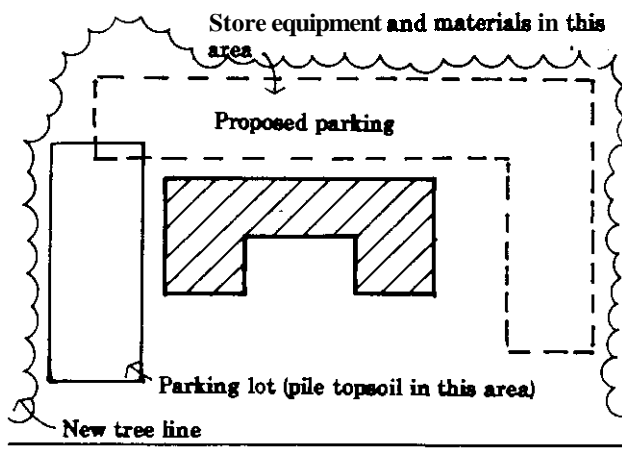
Finished grades will be 1% or greater. Slopes along aisles through lots are recommended to be 6% or less, but in severe cases 8% is permitted. Transverse slopes are to be 1-1/2% or less. Parking areas are to be sited to conform to the natural contours of the site.



Buildings, roads and parking relate to site and views.

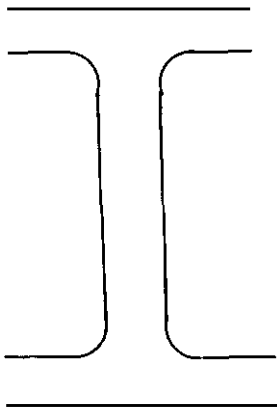


Parking lots at new construction sites will be used as staging areas for equipment and building materials as well as for the stockpiling of topsoil and excavated earth.



PARKING

CIRCULATION AND LAYOUT

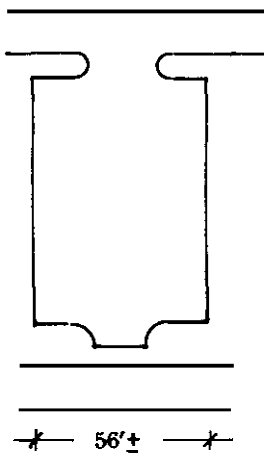


Existing road

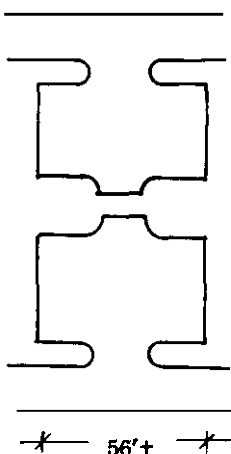
Adapting **Streets To Parking**

The adaptation of streets, which carry little traffic and are in areas where there is a severe parking problem, into parking lots **is** feasible. Note that no option permits a straight shot through to the other street.

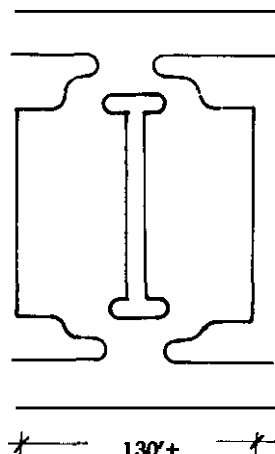
- Option **1**: Simply enlarges the street to permit double loading. The back-in space provides the space to turn around.
- Option **2**: **Is** similar to 1 except each street **has** a parking lot.
- Option **3**: The streets are connected but it is not a straight shot. This solution requires a lot of space.



Option 1



Option 2



Option 3

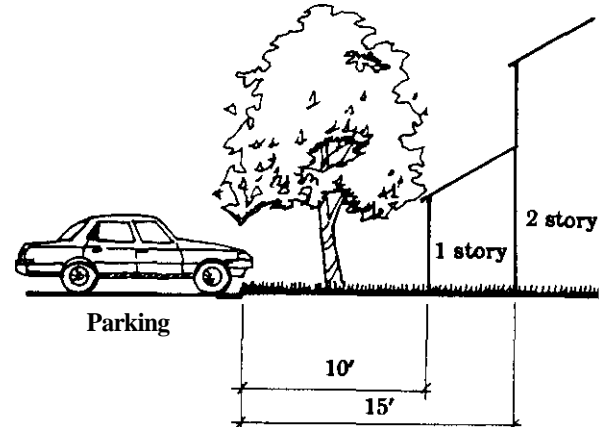


## PARKING SETBACKS

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### Setbacks

Parking lots should be setback from the buildings they serve. Ideally, the minimum setbacks for parking lots shall be 15 feet from a two story building and 10 feet from a one story building. The space between the building and parking lot shall be appropriately landscaped and well maintained. This must be reflected in all new construction. **If** space permits, it is recommended that existing lots be realigned to conform to these standards.



Setback standards



## PARKING

### PARKING ARRANGEMENTS

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#### **Types of Parking Arrangements Permitted**

Three types of parking arrangements are permitted on Post. The preferred type of parking is **Off-Street Surface Parking** lots in groupings of 75 to 100 full car spaces or less. Facilities requiring more than 100 spaces are to have a series of such lots connected by an external perimeter drive. *Also* permitted, is **On-Street Parallel Parking** in areas where a lack of space or physical arrangements of existing buildings make surface lots impractical. *Also* permitted are **Residential Driveways** that are a minimum of 35 feet deep and which allow cars to back into tertiary surface or cul-de-sac streets only. There shall be no provisions for the construction of new on-street, head-in parking or spaces that would require the backing onto a street or road except in a residential driveway situation.



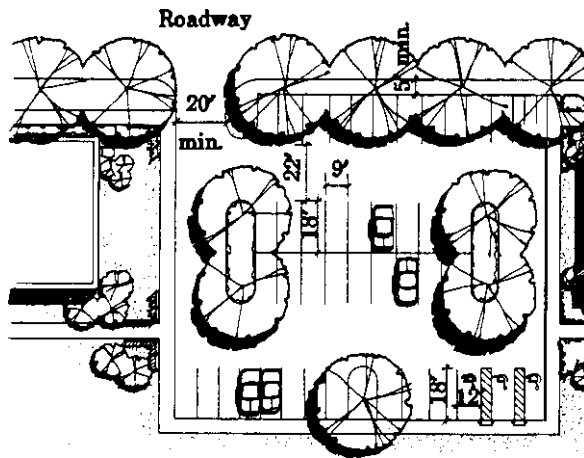


# PARKING

## PARKING ARRANGEMENTS

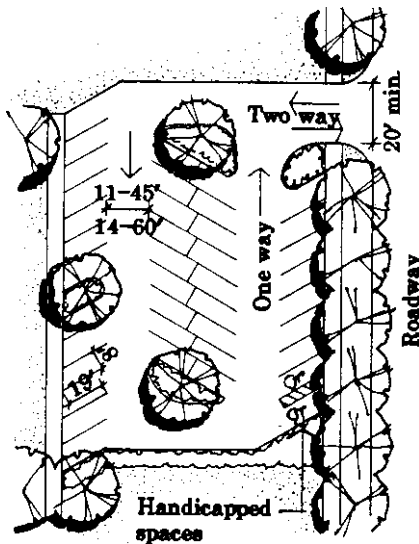
### Off-Street Parking

Perpendicular (90 degree) parking is standard for parking areas having two-way traffic in the aisles, and is the most preferred parking layout. Minimum dimensional standards for 90 degree, off-street parking are illustrated in the graphic.



Perpendicular parking

Angle parking (45 degree and 60 degree) is standard for parking areas with one-way traffic. It provides easier turning into and out of the parking stalls. Angle parking gives better car/stall visibility from the aisle and safer access to the car trunk.



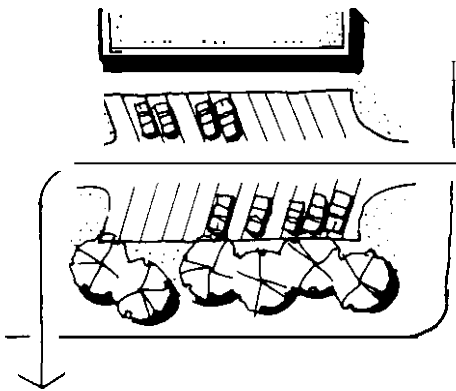
Angle parking

# PARKING

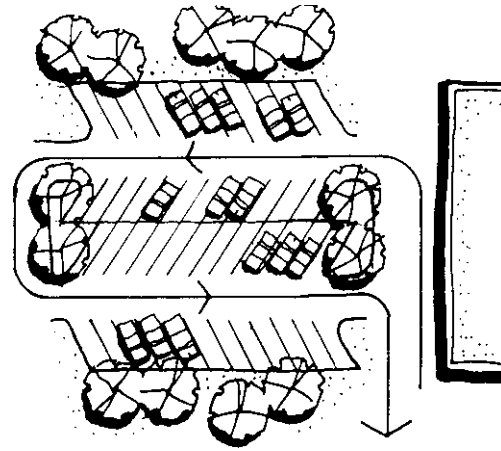
## PARKING ARRANGEMENTS

### Off-Street Parking

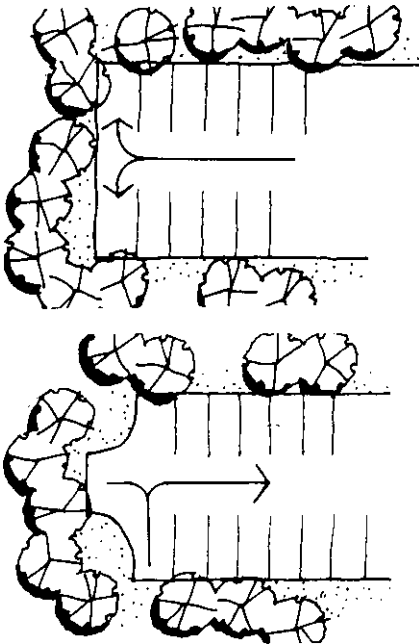
The following examples portray typical parking situations illustrating appropriate parking layout.



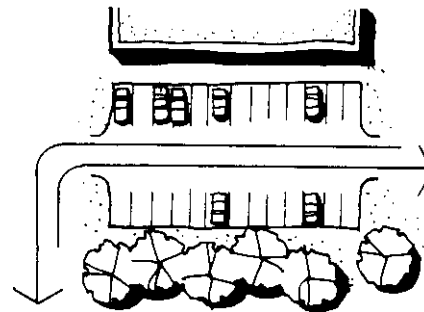
Situation: One-way access through court.  
Layout: Angle parking preferred.



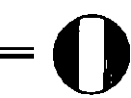
Situation: One-way traffic through **two** court compound.  
Layout: Angle parking preferred.



Situation: Dead end courts must be avoided.  
Layout: Where the aisle lanes cannot be looped, a reserved turning space is needed to prevent the trapping of vehicles.



Situation: Two-way access.  
Layout: Perpendicular parking is required for stall access on both sides.



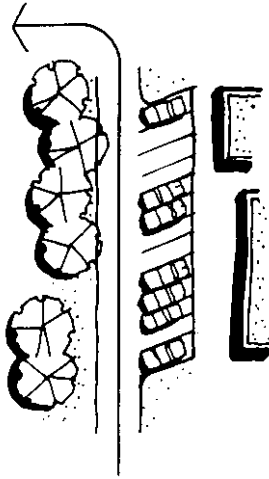
# PARKING

## PARKING ARRANGEMENTS

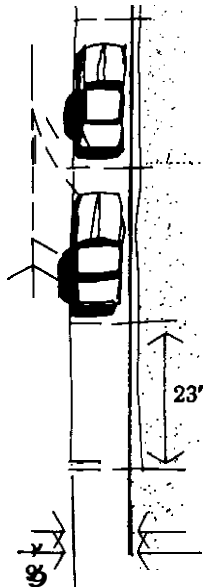
### On-Street Parking

On-street parking is permitted in areas where a lack of space or physical composition of existing buildings make surface lots unfeasible.

Angle parking is preferred when a single bay exists with one-way access.



**Angle parking**



**Parallel parking**

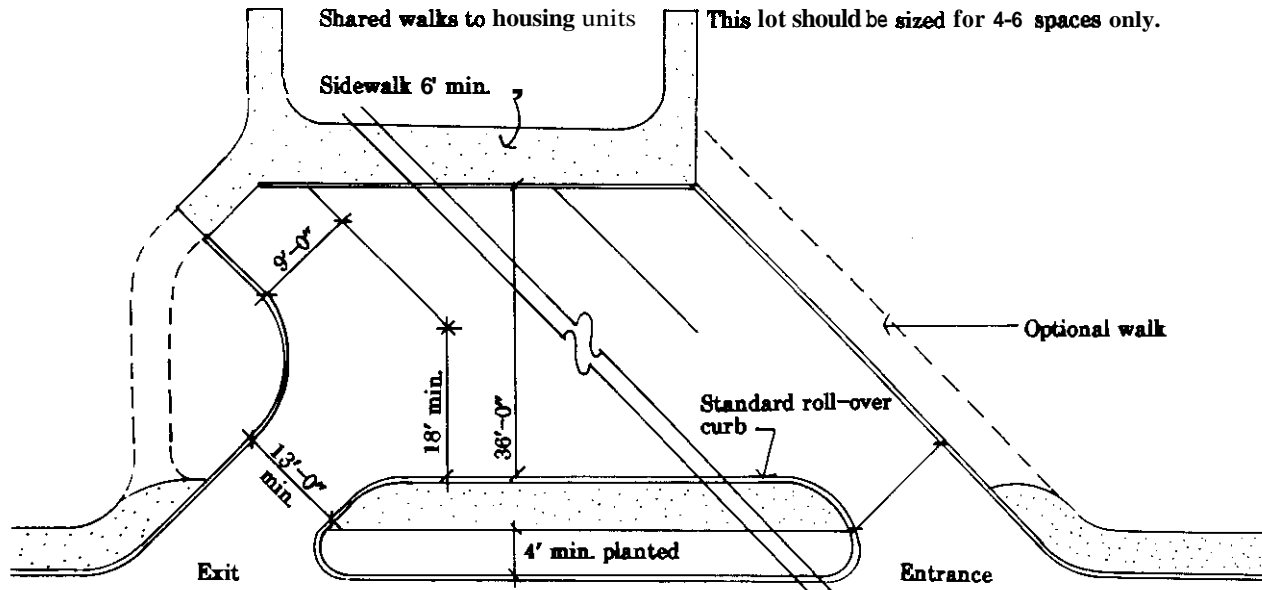
If streets lack sufficient room for perpendicular stall parking, parallel (curb side) parking is permissible. It is acceptable adjacent to low-speed, low-volume trafficways such as residential streets.



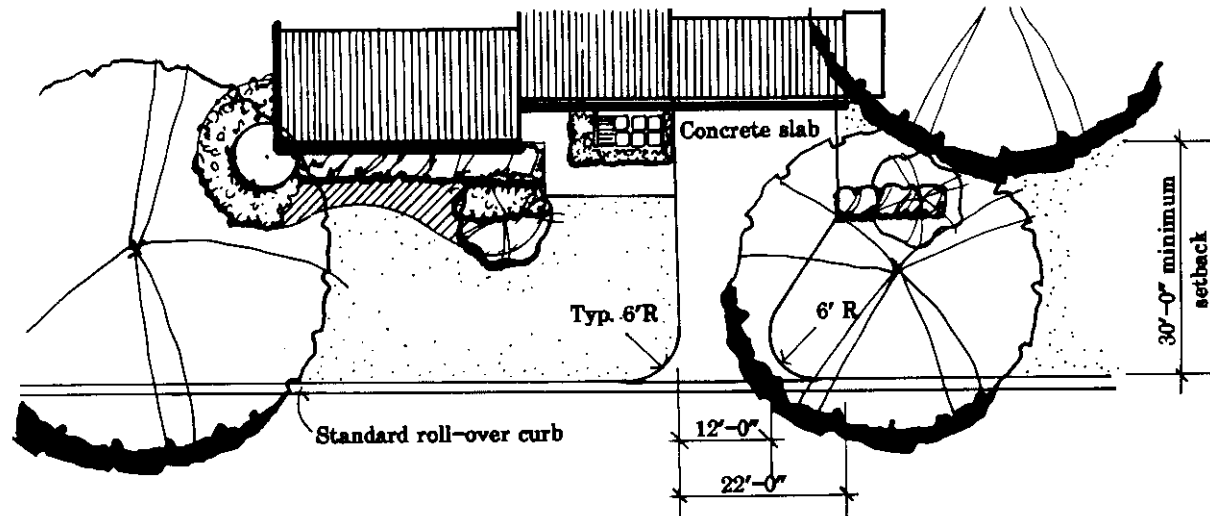
# PARKING

## PARKING ARRANGEMENTS

### Residential Driveways



### Small lot parking - multi-family

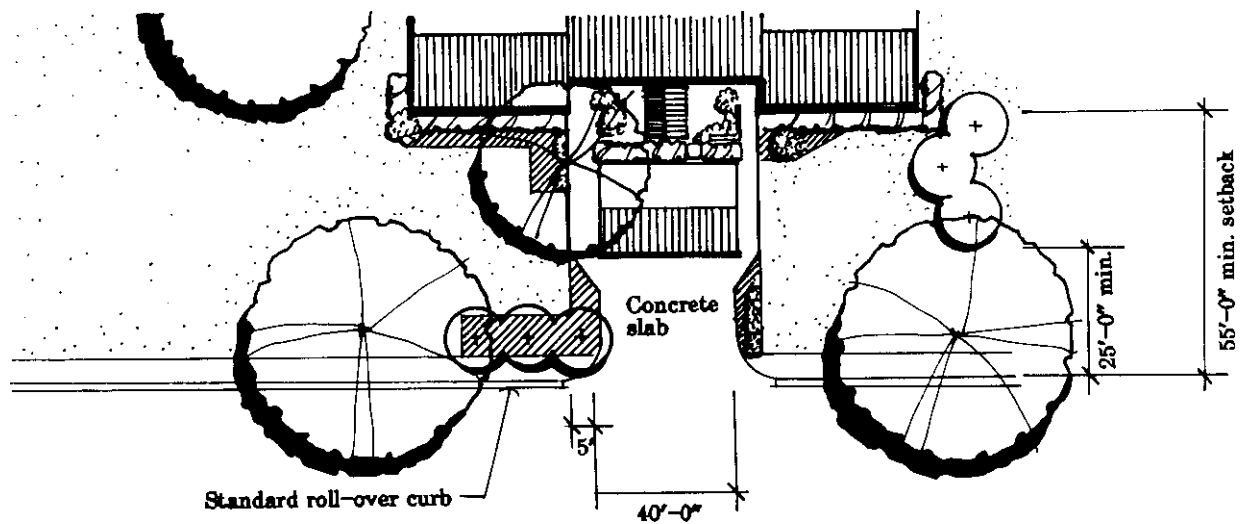
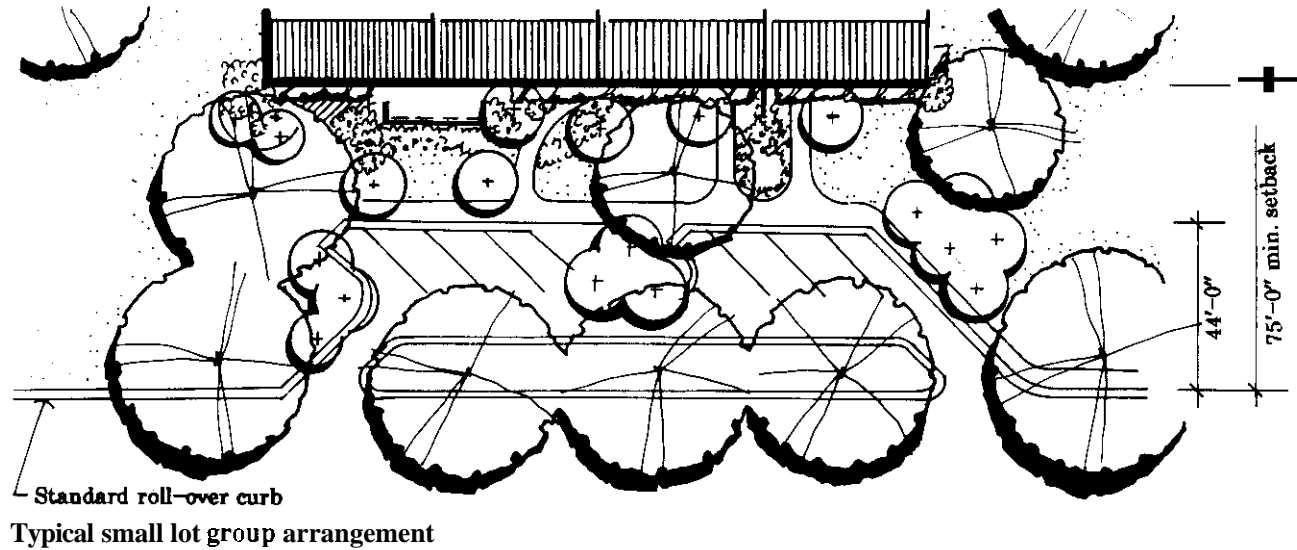


### Typical single family driveway



## PARKING PARKING ARRANGEMENTS

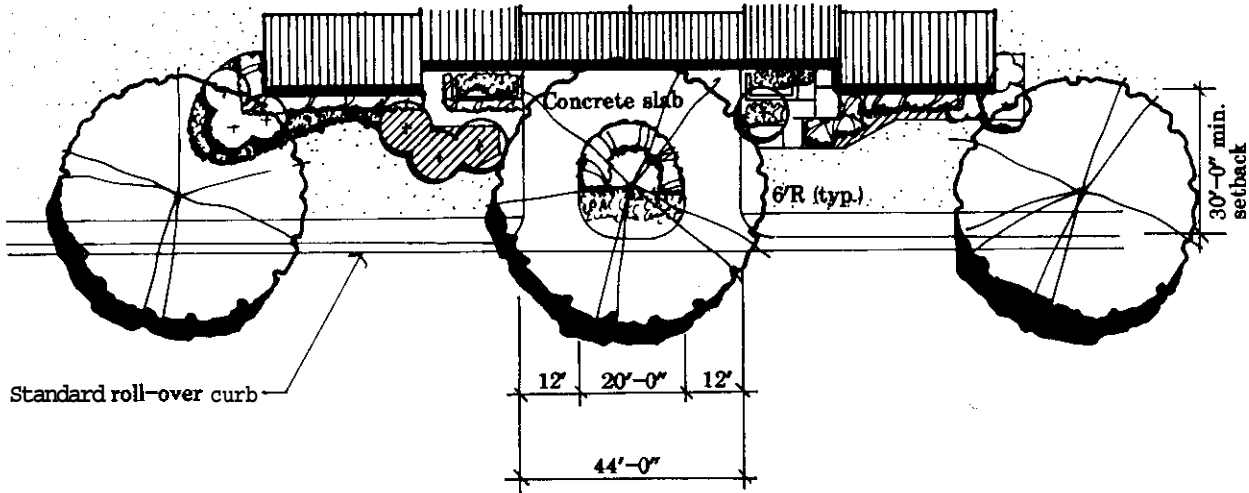
### Residential Driveways



PARKING

PARKING ARRANGEMENTS

Residential Driveways



Typical duplex drive with side carport



## PARKING

### PAVING, MARKINGS & MATERIALS

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#### General Information

A minimum of 10percent of the total parking lot area will remain unpaved and be landscaped or covered by an open mulch material. Surface drainage will be directed to these porous areas wherever practical. The use of porous pavements, "Dutch or "French drains, grates or other measures to increase percolation of rainfall is expected whenever practical. The increased percolation and overall reduction of runoff amounts **is** desired for plant growth and cost savings in storm drain systems.

#### Paving

All permanent parking lots shall be paved with bituminous asphalt. Curb, gutter and concrete curb shall be used for car stops to define the edge of the lot in poorly defined intersections. A concrete edger may be used when there is no clear definition between parking and roadway.

All temporary or short term parking areas will be paved with an adequate ( 6 ) gravel cover that is to be contained on the lot through the use of secured edging timbers.

Parking areas are to be designed to prohibit vehicular access onto grassed or landscaped areas.

#### Markings

Parking markings shall be established with reflective white paint on vinyl film appliques, handicapped spaces shall be drawn using the standard symbol. The use of red or yellow pavement markings shall be used for safety purposes and kept to a minimum.

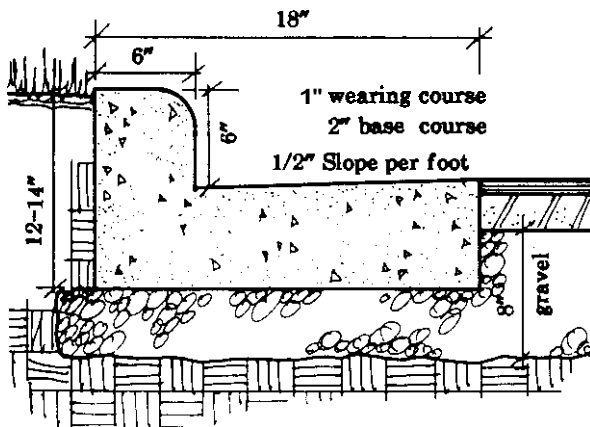
Parking areas shall be designed for easy entrance and exit and shall provide 90 degree parking whenever practical; however, in short term, high-traffic parking areas for such activities **as** commissaries and exchanges, 60 degree parking may be provided.



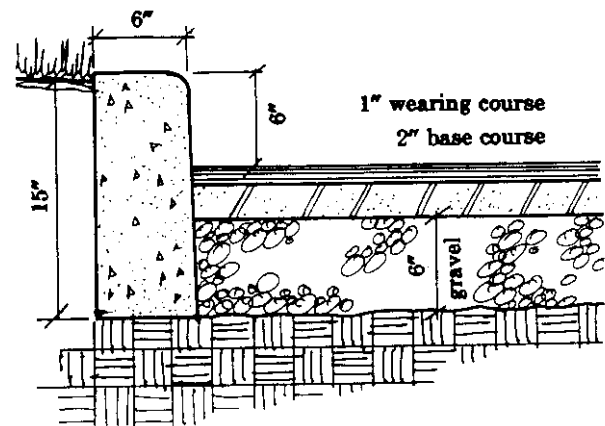
## PARKING PAVING, MARKINGS & MATERIALS

### Materials

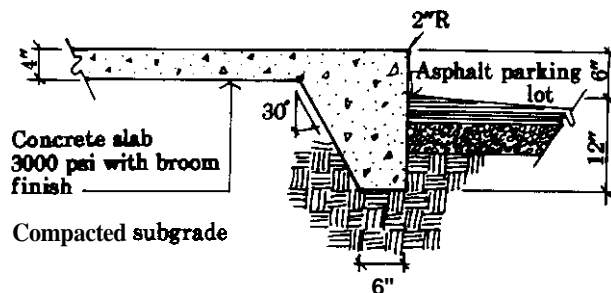
Either a cast-in place curb or a cast-in place curb and gutter can be used in parking lots with the exception of a roll over curb-in housing areas. A gravel shoulder is permissible along roads in naturalized areas. These roads must have few intersections and if the area is developed, curb and gutter shall be installed along the length of the road.



Cast in place curb and gutter

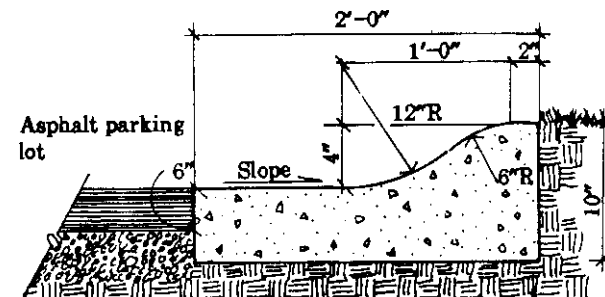


Cast in place curb

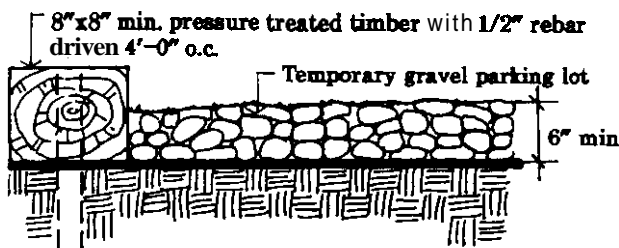


\* To be used in parking areas in lieu of pitched gutter.

Alternate turned down slab/curb



Standard roll over curb



Temporary parking edge/curb



## PARKING LANDSCAPING

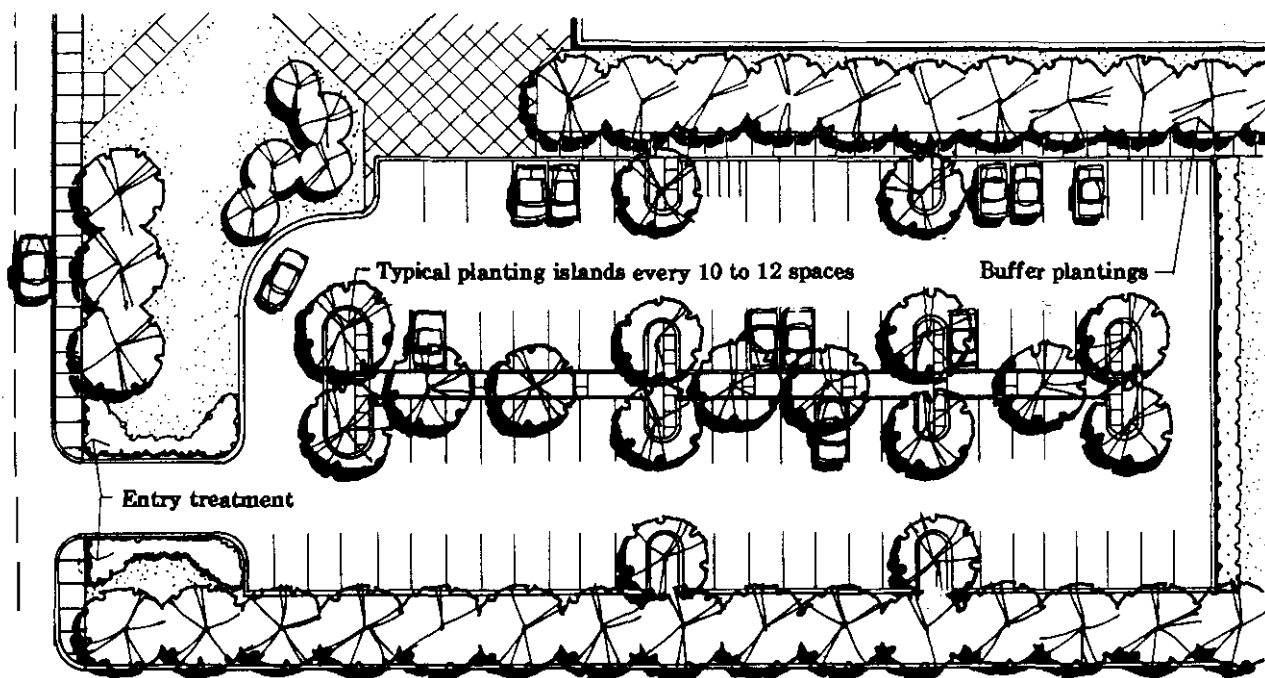
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### Landscaping

**An** essential component in the design of parking lots is the integration of plant materials. Improvements to existing lots when renovated or repaired shall incorporate planting islands and adequate screening of the lot.

The following standards have been established for off-street parking lots:

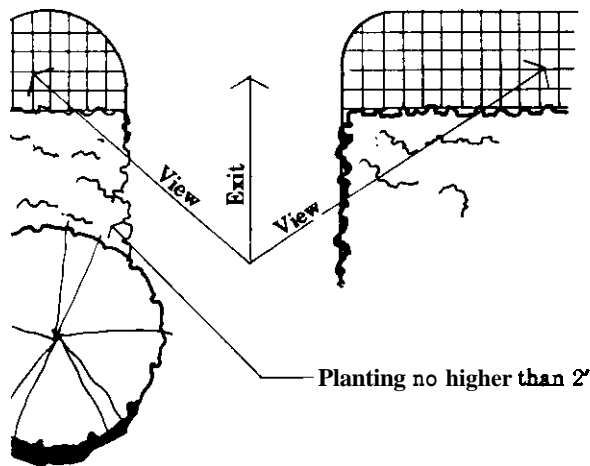
- Planting islands should occur at least once every twelve spaces.
- Parking lots adjacent to primary roads or high visibility areas such as lots adjacent to community service facilities shall be screened with vegetation or low walls or a combination of both. Maximum height of the screen is 36" for security reasons.
- All planting islands shall contain shade trees in parking lots.
- Where possible, incorporate existing mature trees into parking landscape plan, including planting islands.



Typical parking lot landscaping

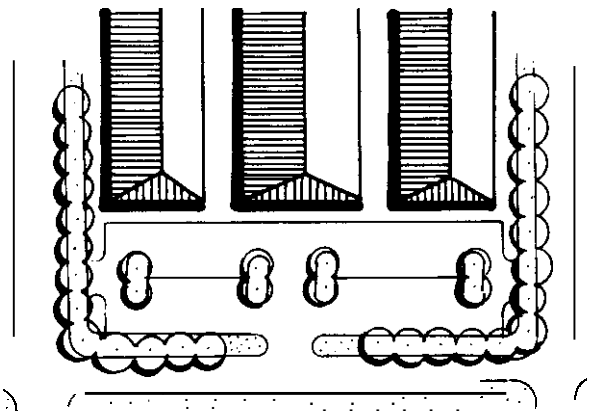


# PARKING LANDSCAPING

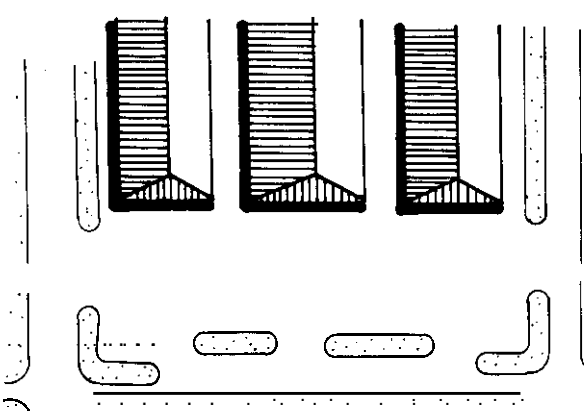


- Parking areas to be screened architecturally or by landscape materials should avoid blocking drivers' **views** at points of exit from the lots.

o Clear points of entry are to be identified through the use of landscape materials.



This



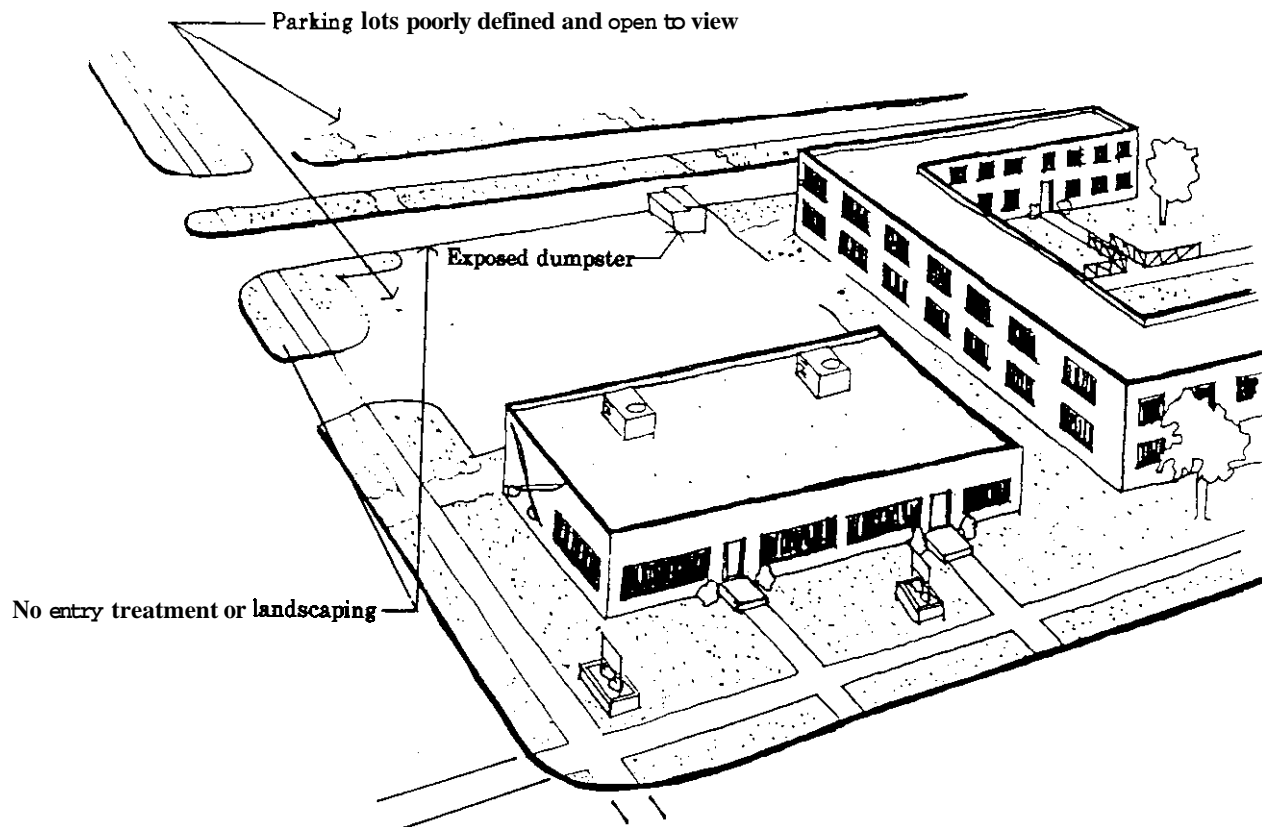
Not this



## PARKING LANDSCAPING

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- Typical existing lots are poorly landscaped and not adequately defined.



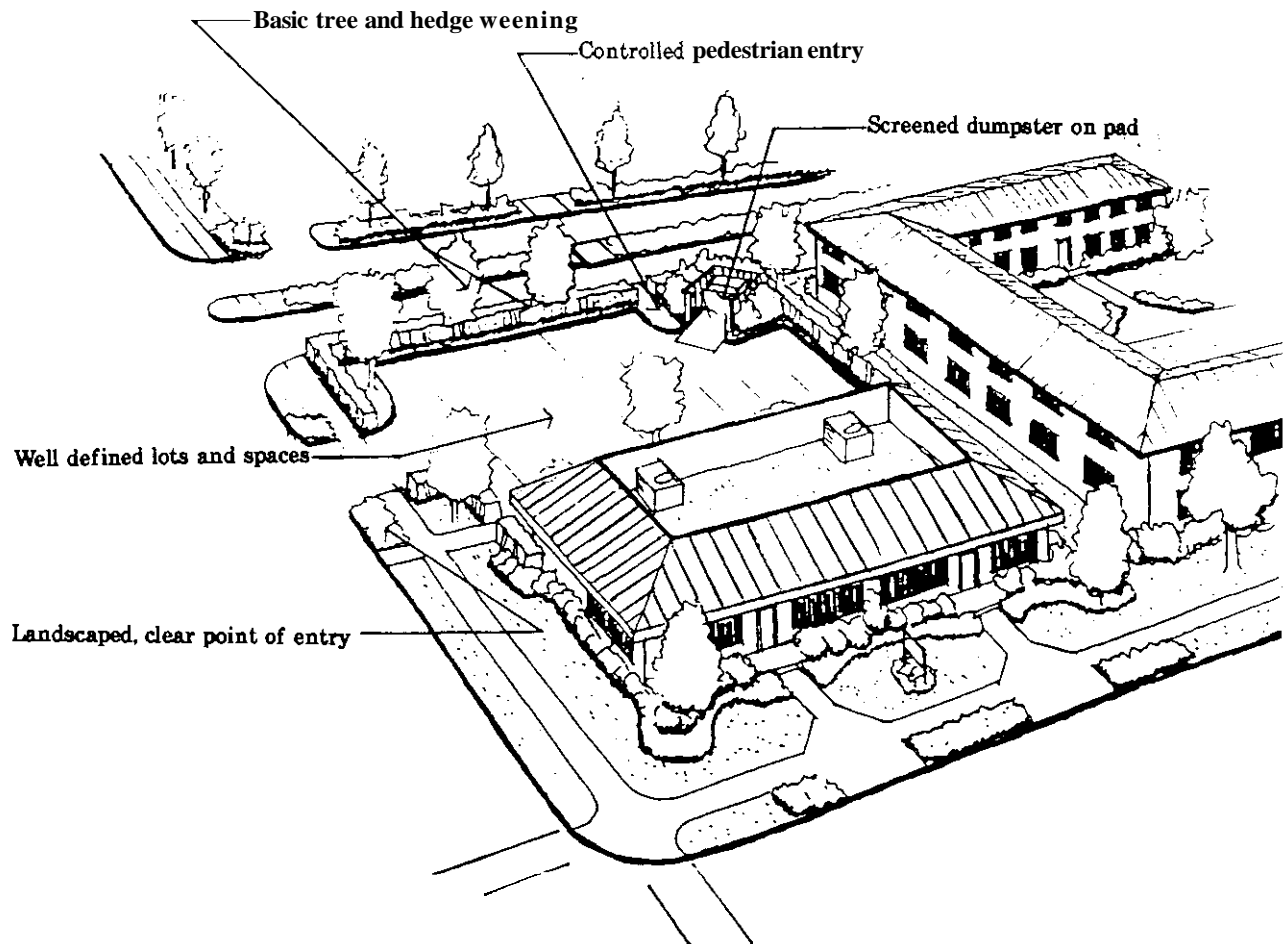
- Typical existing lots are poorly landscaped and not adequately defined

Typical existing parking lot treatment



## PARKING LANDSCAPING

- All new lots and those areas undergoing renovation are to receive basic treatment as shown, with ten (10) percent of the total parking area being reserved for **turf** and other landscape treatment.



\* All new lots and those areas undergoing renovation are to receive basic treatment as shown, with ten(10) percent of the total parking area being reserved for turf and other landscape treatment

Intended parking lot treatment

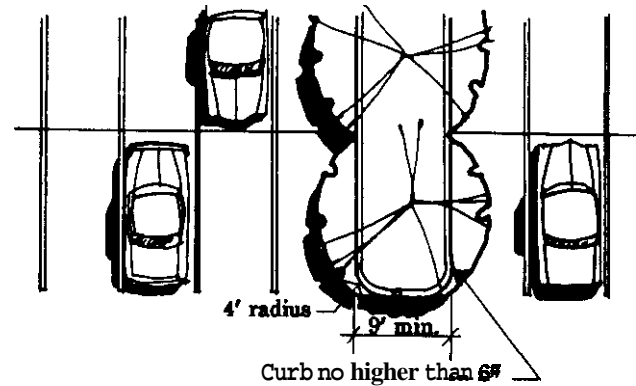


## PARKING PLANTING ISLANDS

### Planting Islands

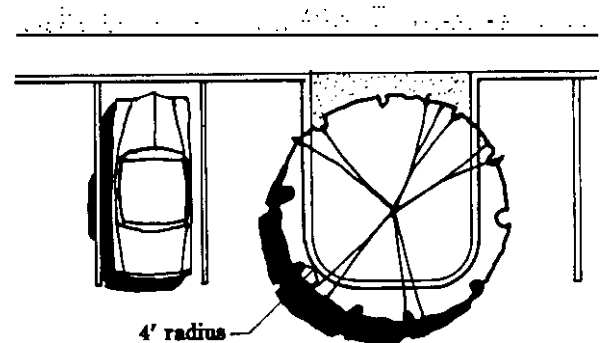
Planting islands soften the overall negative visual image of a parking lot, help to define parking bays and provide areas of drainage within a large area of impervious surface.

New islands shall be planted with shade trees. Ideally, there should be an island at the end of each bay of parking.



Planted island

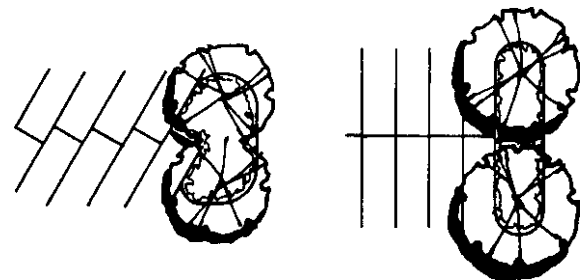
Islands shall be placed around any existing trees to ensure their preservation.



Planter shall be at least 3/4 of radius of branch canopy to preserve the tree

Preservation of existing trees

The turnabout can also be utilized for planting.



Planted turnabouts

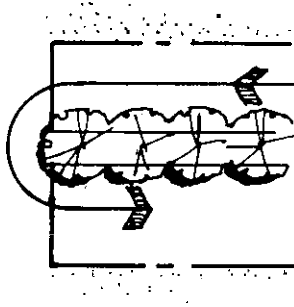


## PARKING BUFFERS OR SCREENS

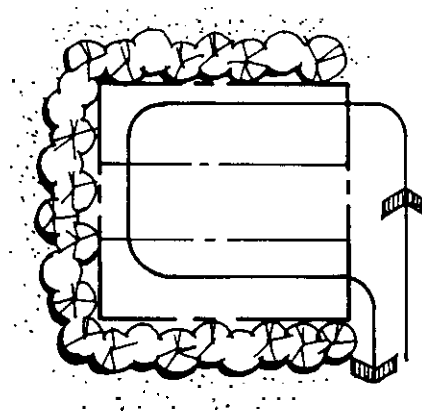
### Buffers of Screens

Parking lots should be screened from other areas by landscaped buffers to reduce the visual impact of large asphalt areas.

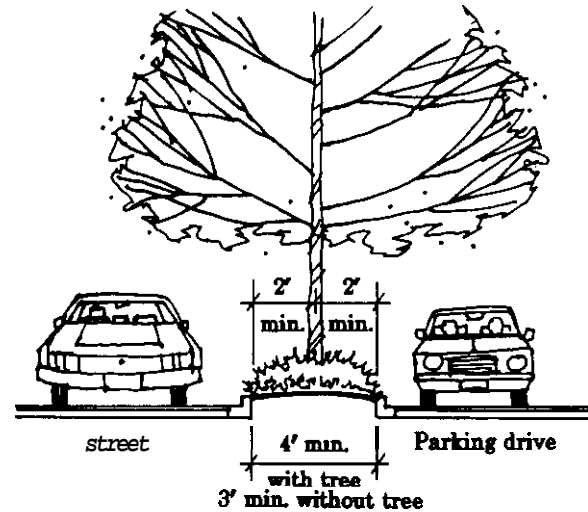
The following are typical situations:



Where space permits, separate the courts with a planting strip.



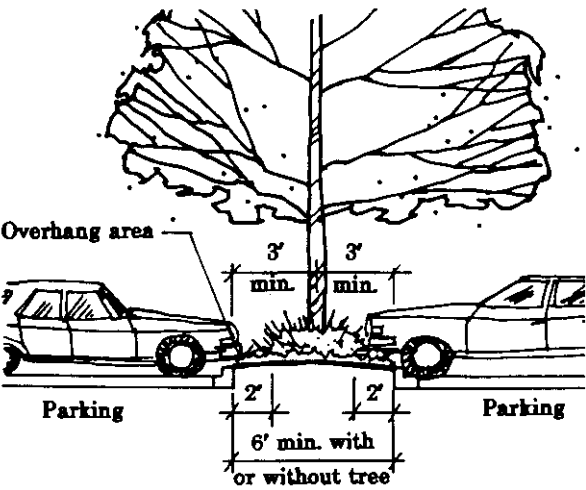
Peripheral shade and screen plantings are always desirable.



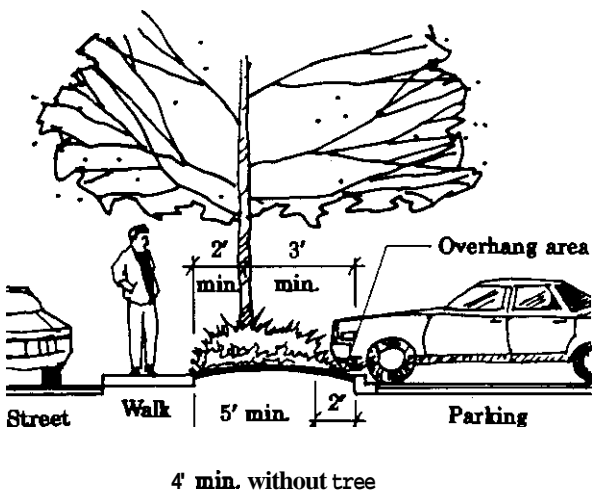
4' width is recommended between street and drive with a tree, 3' of width without.



# PARKING BUFFERS OR SCREENS



6' width is recommended to allow for front and rear car overhang.



5' width is recommended between street and parking with street tree; including adequate room for car overhang. 4' of width is recommended without a tree.

# PARKING

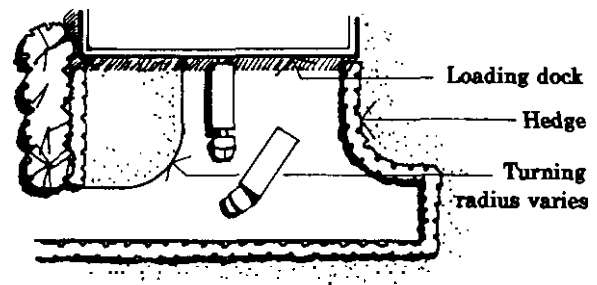
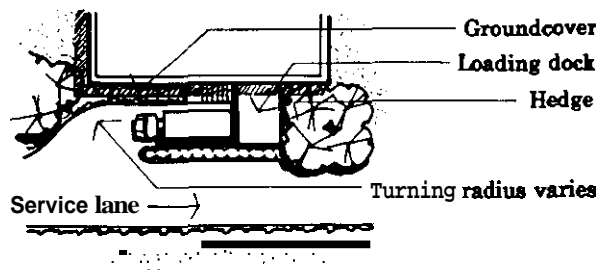
## LOADING DOCKS AND SERVICE AREAS

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### Loading Docks And Service Areas

The following criteria has been established to insure that the design of loading and service areas is executed in a functional and aesthetically pleasing manner.

- o Segregate service traffic.
- o Loading and service areas shall be screened from adjacent streets and high use areas.
- o Loading and service areas shall be designed as an integral part of the building.
- Loading and service areas shall be designed so that the entire servicing operation is conducted within the confines of the building site.
- Loading areas shall only be permitted on the side or rear of the building and shall be designed not to interfere with movement of traffic within the site.



Typical plans of service areas





## LANDSCAPING DESIGN OBJECTIVES

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### Design Objectives

The overall objectives of planting are to improve the physical and psychological well-being of people who live and work on Post. Existing trees, forest lands and plantings are important resources and visual assets that should be carefully preserved and enhanced for functional as well as aesthetic uses. The designer should strive to harmoniously blend the built with the natural environment, provide scale and comfort to pedestrian environs, visually reinforce the hierarchy of the road network; screen unsightly views or elements; and buffer incompatible land uses. The designer should make better use of plant material to improve environmental quality and energy conservation. Proper detailing and plant selection will minimize maintenance requirements.



## LANDSCAPING

### GENERAL INFORMATION

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#### General Information

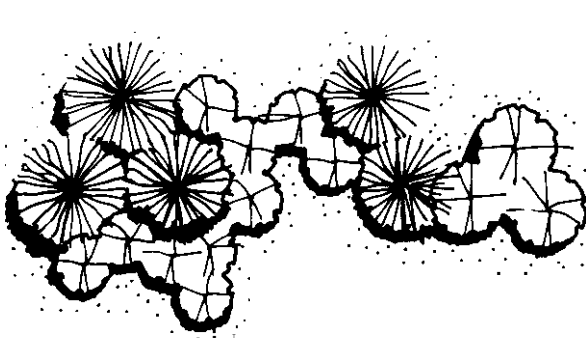
Shrubs should be planted at least 3 feet from buildings. Small trees should be planted at least 10 feet from buildings, and large trees should not be planted closer than 20' to any building.

Generally, it is better to plant dwarf varieties of shrubs in front of windows rather than attempt to keep a shrub low by frequent pruning. Taller plants should be used at corners or around entrances to add emphasis.

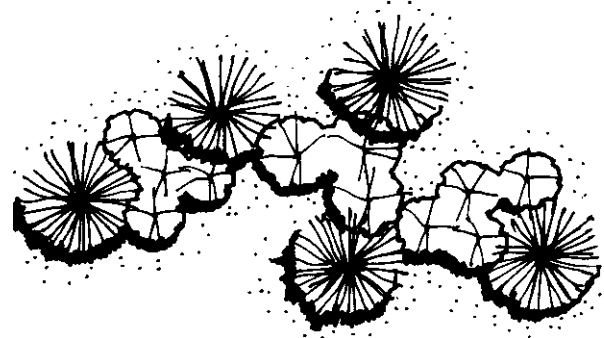
The color of flowers, berries or fall foliage should not clash with the color of the building or other plants in the same composition. When choosing a blooming plant for color accent, remember for most of the year the plant will not be in bloom. Therefore, the plant must have sufficient character when not in bloom to justify its use.

Spacing of plants should be determined by the mature spread of the plant instead of the size of the plant when planted. Don't over plant!

There should be a balance between evergreen and deciduous plant material. Evergreens provide green color year round and are effective in blocking views and providing a backdrop against which altering deciduous plants can be compared. Deciduous plants add excitement and interest to a composition because they indicate the changing of the seasons. Deciduous plants are best used with evergreens in a composition.



**This:** Evergreens are clustered together to unify composition.



**Not this:** Evergreens are too scattered and therefore visually break up composition.



# LANDSCAPING

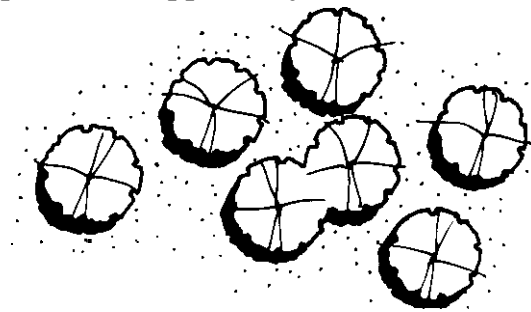
## GENERAL INFORMATION

Plants usually look better when massed than when used alone. When groups of seven or less are used, odd numbers of plants make the most pleasing masses.

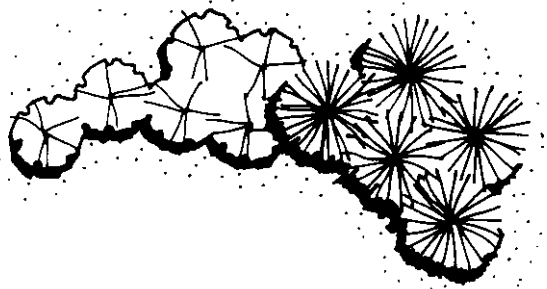
Groups or clusters of plant materials should also be visually connected to avoid wasted space between them. This wasted space causes the composition to appear disjointed and is likely to increase maintenance.



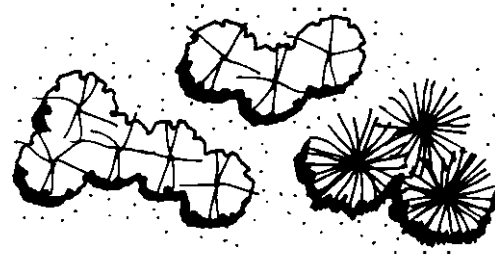
This: Individual plants in composition massed together.



Not this: Individual plants in composition are scattered and spotty, increasing maintenance.



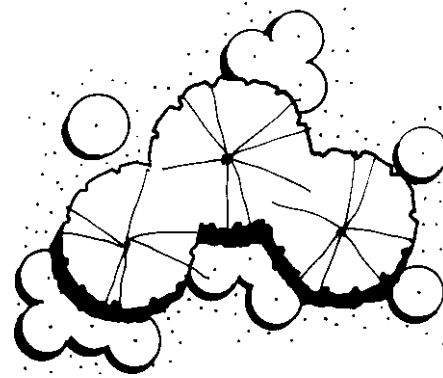
This: Separate plant groups are massed together, avoiding wasted space.



Not this: Wasted space created between separate plant groups, increasing maintenance.



This: Small shrubs are properly massed in larger groups.



Not this: Small shrubs placed in **too** many separate groups.

## LANDSCAPING

### GENERAL INFORMATION

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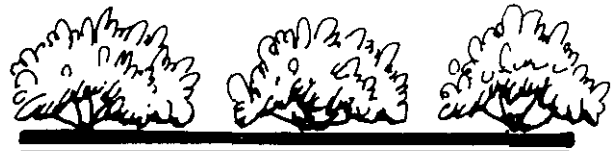
The trimming of shrubs should follow the natural line and form of the plant, severely structured shapes shall be avoided. Plantings will be allowed to grow together and read as a mass instead of single shrubs.

Single hedge gives direction and form.



**This**

Individual plants require increased maintenance.



**Not this**

All plants will receive three inches of mulch that should entirely cover the area of the planting pit, bed, or saucer around each plant. Pecan shells, pine bark mulch, and/or pine straw are permitted mulches.

All roof drains throughout post which are *not* piped underground will have splash blocks. The splash block will be a concrete set stained a dark brown— a minimum of **12" x 24" x 2"**.

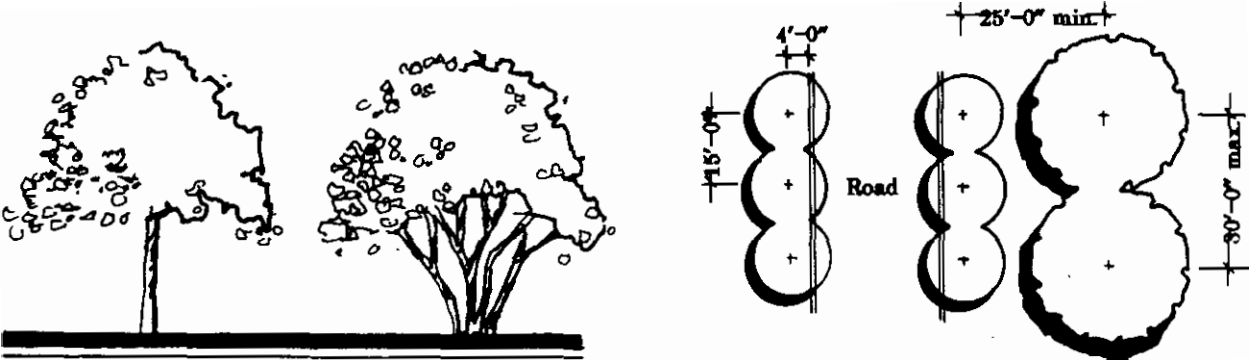
Due to the number of Crape Myrtles and their importance to the image of the Post, their continued use in new plantings should be encouraged at Fort Jackson. The Crape Myrtles form is upright and open or rounded. It can be a multiple trunked tree or it may be trained as a standard. With annual pruning, this plant may be maintained as a shrub. The Crape Myrtle starts flowering in July and continues until frost, it blooms in a wide variety of colors including white, pink, red, and lavender. When selecting varieties, remember that color is usually more effective when used in mass instead of the spotty effect that results when too many colors are mixed.



LANDSCAPING

GENERAL INFORMATION

Crape Myrtles are deciduous, they should be planted in full sun for best bloom and in soil that drains well. Crape Myrtles will reach a height of 15-25 feet with a spread of 5-15 feet depending on the variety. Generally the species has good fall coloring, but in the winter the bark of the Crape Myrtle becomes the attraction. With age, most varieties shed their outer bark to reveal a lighter underbark, giving added seasonal interest. When Crape Myrtles are used in foundation plantings they will be planted a minimum of 8' from the foundation. Crape Myrtles would have to be combined with evergreens to form an effective screen.



Crape Myrtle spacing requirements



## LANDSCAPING

### PLANT MATERIAL

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#### **Plant Material**

The following charts are guides for the selection of plant material for new plantings on Post. Their purpose is to aid professionals in selecting hardy, durable plants that will withstand the type of maintenance available on Post. The lists provide a broad selection of plants that can be used for most design situations. However, within the Installation there are various microclimates that must be considered when choosing a species. Professional recommendations are to be reviewed and approved by qualified personnel on Post prior to installation.

As regional climate fluctuates and new diseases and insects move into the area, certain plants may need to be eliminated from the lists. Likewise, as new plant varieties and species become available, the lists will need to be updated.



# LANDSCAPING PLANT MATERIAL

## Trees

	DESCRIPTION																		CULTURE								USE														
	Group:	Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low			
Botanical Name																																									
Common Name																																									
Acer negundo Boxelder																																									
Acer rubrum Red Maple*																																									
Acer saccharum Sugar Maple*																																									
Aesculus pavia Red Buckeye																																									
Betula nigra River Birch																																									
Carya illinoensis Pecan																																									
Celtis laevigata Sugarberry																																									
Celtis occidentalis Hackberry																																									
Cercis canadensis Redbud*																																									
Cornus florida Dogwood																																									
Crataegus marshallii Hawthorn																																									



# LANDSCAPING PLANT MATERIAL

	DESCRIPTION																CULTURE						USE																	
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low			
Botanical Name																																								
Common Name																																								
Diospyros virginiana Persimmon																																								
Ginkgo biloba Ginkgo																																								
Ilex decidua Possumhaw																																								
Ilex opaca American Holly																																								
Juniperus virginiana Red Cedar																																								
Lagerstroemia indica Crape Myrtle																																								
Liquidambar styraciflua Sweetgum																																								
Liriodendron tulipifera Tulip Tree																																								
Magnolia grandiflora Magnolia																																								





# LANDSCAPING PLANT MATERIAL

	DESCRIPTION												CULTURE						USE																			
	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall				
Botanical Name																																						
Common Name																																						
Magnolia soulangeana Saucer Magnolia*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>					
Malus floribunda Crabapple*	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>					
Nyssa sylvatica Blackgum	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				
Oxydendrum arboreum Sourwood	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							<input checked="" type="checkbox"/>				
Pinus echinata Shortleaf Pine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Pinus elliotii Slash Pine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Pinus palustris Longleaf Pine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Pinus taeda Loblolly Pine	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Platanus occidentalis Sycamore	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
Prunus caroliniana Cherry Laurel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					
Quercus alba White Oak	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						



# LANDSCAPING PLANT MATERIAL

	DESCRIPTION																	CULTURE							USE													
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Pyramidal	Columnar	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low	
Botanical Name																																						
Common Name																																						
<i>Quercus coccinea</i> Scarlet Oak	■			■		■					■						■		■				■		■			■				■						
<i>Quercus falcata</i> Southern Red	■		■			■					■		■			■		■	■				■		■		■		■		■	■	■	■				
<i>Quercus nigra</i> Water Oak		■		■			■				■				■				■	■		■	■		■	■		■			■			■				
<i>Quercus palustris</i> Pin Oak		■		■			■						■						■	■			■	■		■		■		■			■	■	■	■		
<i>Quercus phellos</i> Willow Oak*		■		■			■				■								■			■			■		■		■		■		■	■	■	■		
<i>Quercus stellata</i> Post Oak		■		■		■					■								■	■		■	■		■		■		■		■		■	■	■	■		
<i>Quercus virginiana</i> Live Oak	■			■		■			■								■		■	■			■				■		■				■		■			■
<i>Sassafras albidum</i> Sassafras		■		■	■				■										■	■			■		■		■		■			■		■				
<i>Salix nigra</i> Black Willow		■	■			■				■				■		■	■	■			■					■		■		■				■		■		
<i>Zelkova serrata</i> Zelkova	■	■	■			■				■						■			■	■			■				■						■		■			

\*Indicates plant material is available at the U-do-it Center



# LANDSCAPING PLANT MATERIAL

## Shrubs

	DESCRIPTION															CULTURE										USE												
	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low				
Botanical Name																																						
Common Name																																						
Abeilia sp. Abelia*	■		■				■	■		■		■				■	■		■					■		■									■			
Azalea sp. Azalea	■		■				■	■				■		■			■		■			■	■		■				■	■		■						
Berberis sp. Barberry	■	■	■				■			■						■	■		■					■		■						■		■				
Buxus sempervirens Boxwood	■			■			■				■	■				■	■		■			■	■		■							■	■					
Chaenameles japonica Quince		■	■			■		■				■	■			■			■				■							■		■						
Cleyera japonica Cleyera'	■		■			■				■		■					■	■		■			■		■				■			■						
Cotoneaster sp. Rockspray*	■			■			■	■	■					■		■						■	■	■		■		■			■							
Deutzia gracilis Slender Deutzia		■		■		■	■	■		■						■			■	■	■	■		■		■	■					■						
Elaeagnus sp. Elaeagnus	■	■				■				■			■	■		■	■		■			■	■	■		■		■			■			■				
Euonymus alatus 'nana' Burning Bush		■	■			■						■				■	■				■	■	■		■					■		■						



# LANDSCAPING PLANT MATERIAL

	DESCRIPTION																CULTURE								USE															
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low					
Botanical Name																																								
Common Name																																								
<i>Forsythia</i> sp. Golden Bells		■	■				■		■				■			■		■				■	■	■				■						■						
<i>Ilex cornuta</i> <i>burfordi</i> Burford Holly	■		■				■					■		■				■	■				■		■			■							■					
<i>Ilex cornuta</i> <i>rotunda</i> Chinese Holly	■		■			■	■				■				■		■	■			■			■		■		■								■				
<i>Ilex crenata</i> <i>compacta</i> Japanese Holly*	■			■				■			■						■	■			■				■	■		■								■				
<i>Ilex crenata</i> 'Helleri' Heller Japanese Holly*	■				■			■		■				■			■	■			■				■		■									■				
<i>Ilex crenata</i> <i>microphylla</i> Japanese Holly	■				■			■		■				■			■	■			■				■		■										■			
<i>Ilex vomitoria nana</i> Yaupon Holly*	■				■			■						■		■	■	■	■	■	■	■			■		■									■				
<i>Juniperus</i> sp. Juniper*	■			■				■		■				■			■						■	■		■			■	■	■									
<i>Ligustrum</i> sp. Privet	■		■			■	■	■					■	■			■	■			■				■			■								■				



# LANDSCAPING PLANT MATERIAL

	DESCRIPTION																CULTURE								USE															
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low					
botanical Name																																								
Common Name																																								
Mahonia bealei Leatherleaf Mahonia*	■					■	■		■					■				■		■				■			■							■						
Nandina domestica Heavenly Bamboo*	■			■				■						■			■	■		■			■		■		■						■							
Philadelphus virginalis Mock Orange		■		■			■		■					■			■			■					■		■						■							
Prunus laurocerasus English Laurel	■			■		■	■						■	■			■	■	■	■			■	■	■		■			■			■		■					
Pyracantha sp. Pyracantha	■		■				■						■				■	■		■			■	■	■		■						■	■						
Santolina chamaecyparissuys Gray Santolina	■			■				■	■						■		■					■	■		■				■				■							
Spiraea sp. Spiraea		■	■	■			■	■		■				■			■			■				■				■			■			■						
Viburnum sp. Viburnum*	■	■	■	■		■			■	■				■	■		■	■		■				■	■	■		■						■	■					
Weigela florida Weigelia		■		■					■						■	■	■							■		■		■						■						
Cortaderia selloana Pampas Grass	■	■	■				■	■					■	■			■	■		■	■	■		■	■		■							■		■				



# LANDSCAPING PLANT MATERIAL

	DESCRIPTION																CULTURE								USE															
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Rounded	Oval	Irregular	Upright	Spreading	Weeping	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Street Trees	Ornamental	Screen-Tall	Screen-Low					
Botanical Name																																								
Common Name																																								
Hypericum patulum St. John's Wort	■		■				■		■						■		■					■			■	■	■	■					■		■					
Myrica pensylvanica Bayberry	■			■			■			■					■		■	■			■	■			■	■	■	■			■				■					
Photinia glabra Red Tip	■		■				■						■				■				■				■		■							■	■	■				
Yucca filamentosa Adam's Needle	■			■		■		■									■	■				■	■	■	■			■			■		■							

\*Indicates plant material is available at the U-do-it Center.



# LANDSCAPING PLANT MATERIAL

## Groundcovers

	DESCRIPTION														CULTURE										USE								
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Pyramidal	Irregular	Upright	Spreading	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Ornamental	Screen-Tall	Screen-Low	
Botanical Name																																	
Common Name																																	
Ajuga reptans Carpet Bugle	■		■			■			■		■			■		■		■			■	■			■			■		■			
Cotoneastersp. Cotoneaster	■			■				■	■	■				■	■					■	■	■			■		■						
Gelsemium sempervirens Carolina Jessamine	■			■				■	■						■	■	■		■				■		■					■	■	■	
Hedera sp. Ivy	■		■	■		■	■									■	■	■				■			■		■	■					
Hemerocallis sp. Daylily		■	■			■	■		■					■	■	■		■	■	■			■	■	■	■			■	■			
Hypericum calycinum Aaronsbeard	■		■					■		■				■	■	■			■	■	■		■	■	■	■	■	■			■		
Juniperus sp. Juniper	■			■				■		■				■	■					■	■		■			■				■		■	
Liriope sp. Monkey Grass	■		■			■		■	■					■		■	■		■			■	■	■	■	■	■	■	■				
Ophiopogon japonicum Mondo Grass	■							■						■		■	■		■		■		■	■	■	■	■	■	■				



# LANDSCAPING

## PLANT MATERIAL

	DESCRIPTION															CULTURE										USE							
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Slow	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Horizontal	Pyramidal	Irregular	Upright	Spreading	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Ornamental	Screen-Tall	Screen-Low	
Botanical Name																																	
Common Name																																	
Pachysandra terminalis Japanese Spruce	■			■	■		■							■			■		■				■	■	■	■		■					
Vinca major Periwinkle	■		■				■		■			■	■	■	■	■	■			■		■				■	■	■	■				
Vinca minor Periwinkle	■		■				■		■				■			■	■			■		■				■	■	■	■				
Euonymous fortunei 'radicans' Wintercreeper	■			■				■							■	■	■	■	■			■			■		■	■	■				■
Phlox subulata Thrift	■		■				■	■					■	■						■	■		■		■	■	■				■		





# LANDSCAPING PLANT MATERIAL

## Vines

	DESCRIPTION								CULTURE								USE											
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Texture: Coarse	Medium	Fine	Flowering: Yes	Form: Spreading	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Low	Environmental: Erosion	Shade	Transitional/Natural	Visual: Ornamental	Screen-Tall	Screen-Low	
Botanical Name																												
Common Name																												
Ampelopsis brevipedunculata Ampelopsis		■	■	■		■				■	■			■		■		■		■				■		■	■	
Campis radicans Trumpetcreeper		■	■			■		■		■	■		■	■	■			■	■	■	■			■		■		
Clematis sp. Clematis		■	■		■	■	■			■	■		■	■	■			■	■	■	■			■		■		
Gelsemium sempervirens Carolina Jessamine	■			■			■	■		■	■	■		■				■		■		■						
Hedera helix English Ivy	■		■	■	■	■																						
Lonicera sp. Honeysuckle	■	■	■		■	■		■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■			
Vitis sp. Grape		■	■		■					■				■		■	■			■				■				
Rosa hybrida Climbing Rose		■	■			■	■	■		■				■		■	■		■						■		■	
Parthenocissus quinquefolia Virginia Creeper		■		■	■					■	■			■				■		■		■	■	■				



# LANDSCAPING PLANT MATERIAL

	DESCRIPTION							CU				JRE				USE								
	Group: Evergreen	Deciduous	Growth rate: Fast	Moderate	Texture: Coarse	Medium	Fine	Flowering: Yes	Exposure: Sun	Semi-Shade	Shade	Moisture Requirement: High	Medium	Well-drained	Pest/Disease: Subject	Not Subject	Soil Fertility: High	Medium	Environmental: Erosion	Shade	Transitional/Natural	Visual: Ornamental	Screen-Tall	
Botanical Name																								
Common Name																								
Passiflora incarnata Passion Flower		■			■	■	■	■	■				■		■	■	■	■			■			
Ploygonum auberti Silvervine		■	■		■	■		■	■				■		■	■		■			■			
Rosabanksiae Banks Rose	■		■			■	■	■	■	■	■	■	■	■	■	■	■	■				■	■	■
Wisteria sp. Wisteria		■	■			■	■	■	■				■		■		■				■			



# LANDSCAPING

## PLANT MATERIAL

### Turf

	ON		CULTURE								USE	
	Flowering: Yes	Form: Spreading	Exposure: Sun	Semi-Shade	Moisture Requirement: High	Medium	Low	Well-drained	Pest/Disease: Subject	Soil Fertility: Medium	Environmental: Erosion	Transitional/Natural
<b>botanical Name</b>												
<b>Common Name</b>												
<i>Axonopus affinis</i> Carpet Grass	■	■				■	■		■	■	■	■
<i>Cynodon dactylon</i> Bermudagrass **	■		■	■		■	■	■	■	■	■	
<i>Lolium multiflorum</i> Annual Ryegrass	■	■				■	■		■	■	■	
<i>WildflowerSeed</i> <i>Mix</i> ***					■						■	■

\*\* Or suitable hybrids of bermuda, including Tifway (Tifton419)

\*\*\* All wildflower seed mixtures to contain **40%** annuals, 20% biennials, and **40%** perennials with a mixture of spring, summer and fall blooming species using a minimum of **12** species. Mixture can be adapted for erosion control, shade tolerance and/or height restrictions.

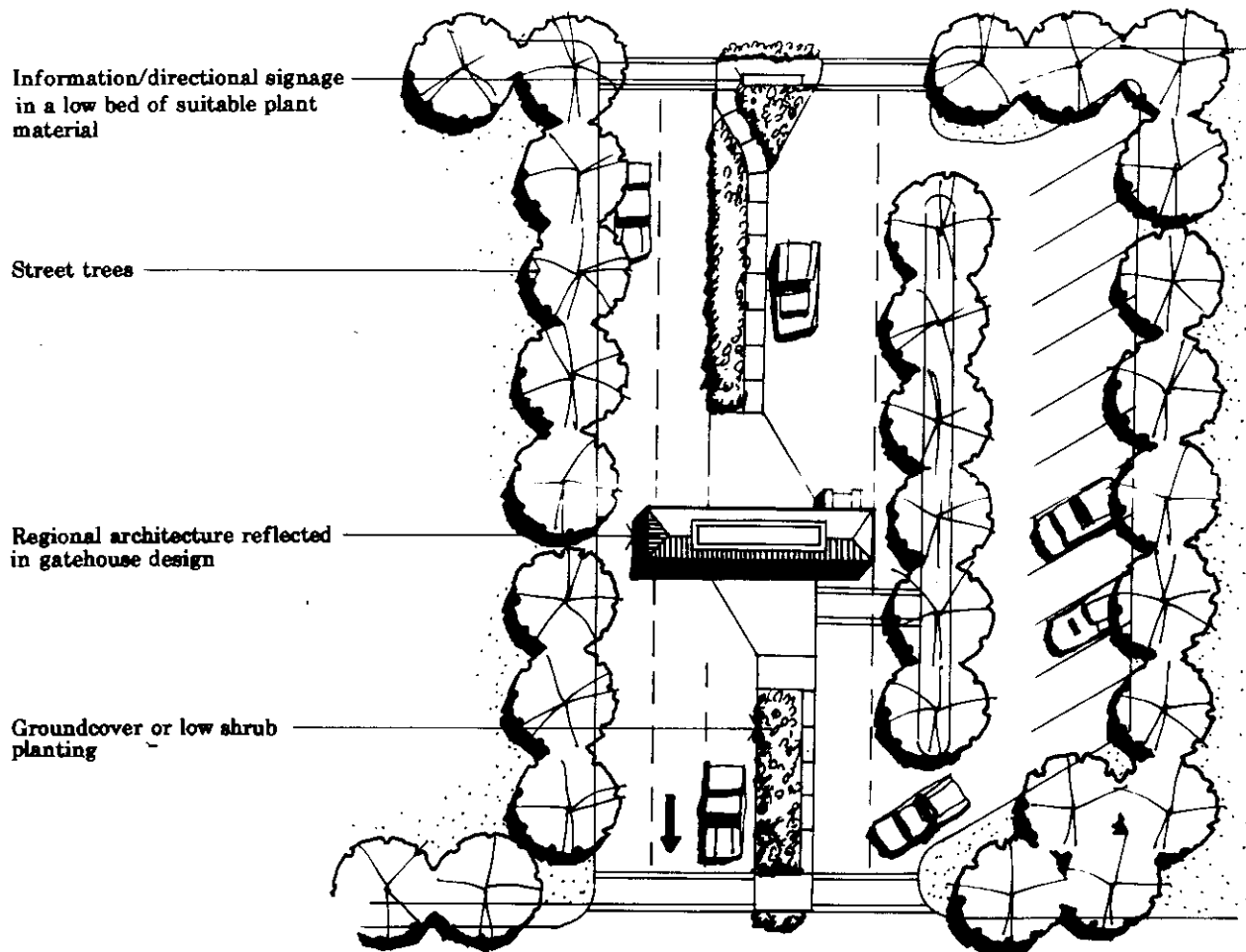


# LANDSCAPING

## ENTRY PLANTING

### Installation Entry

The entrance to an Installation should project a positive first impression. Landscaping the gate-houses and surrounding areas will create an attractive and safe sense of entry which reflects a positive image and identity for the Installation. The appropriate landscaping can provide an effective yet unobstructive security system which will enhance Fort Jackson's public image and minimize its utilitarian appearance. Low groundcovers and plantings are to be used around the main entrances to add visual interest while reserving sightlines. Street trees are used to spatially define entrances and visually reinforce the traffic circulation pattern.



Typical entry landscaping



## LANDSCAPING

### ENTRY PLANTING

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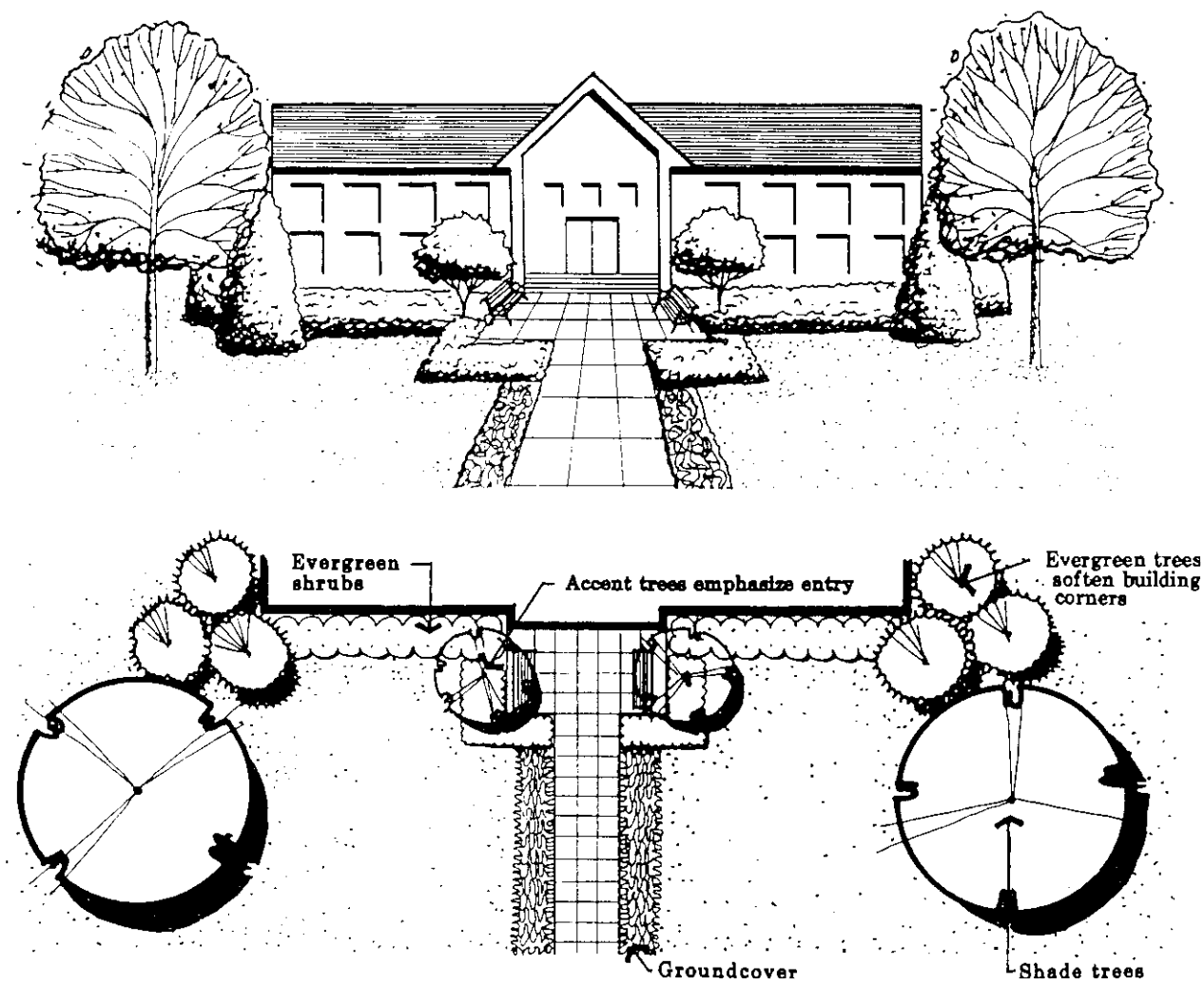
#### **Building Entry**

Landscaping at buildings should provide a positive sense of arrival. Pavement and the proper placement of trees, shrubs, and groundcover are to direct the pedestrian to the entrance. Large trees can be used to reduce the perceived size of large buildings to a human scale and provide valuable shade. Flowering trees give an added dimension and seasonal variation. Other plants, such as shrubs, groundcover, and lawn, will help define the space.

The following examples are just representative of the many alternatives appropriate for building entries. Each entry planting shall respond to the architecture, whether symmetrical or not, to complement and define the entry in the most visually pleasing and functional manner. The character of the plantings in the adjacent areas are to be considered as well as the streetscape planting. The goal is to provide emphasis for important buildings while harmonizing with the surrounding area.

LANDSCAPING

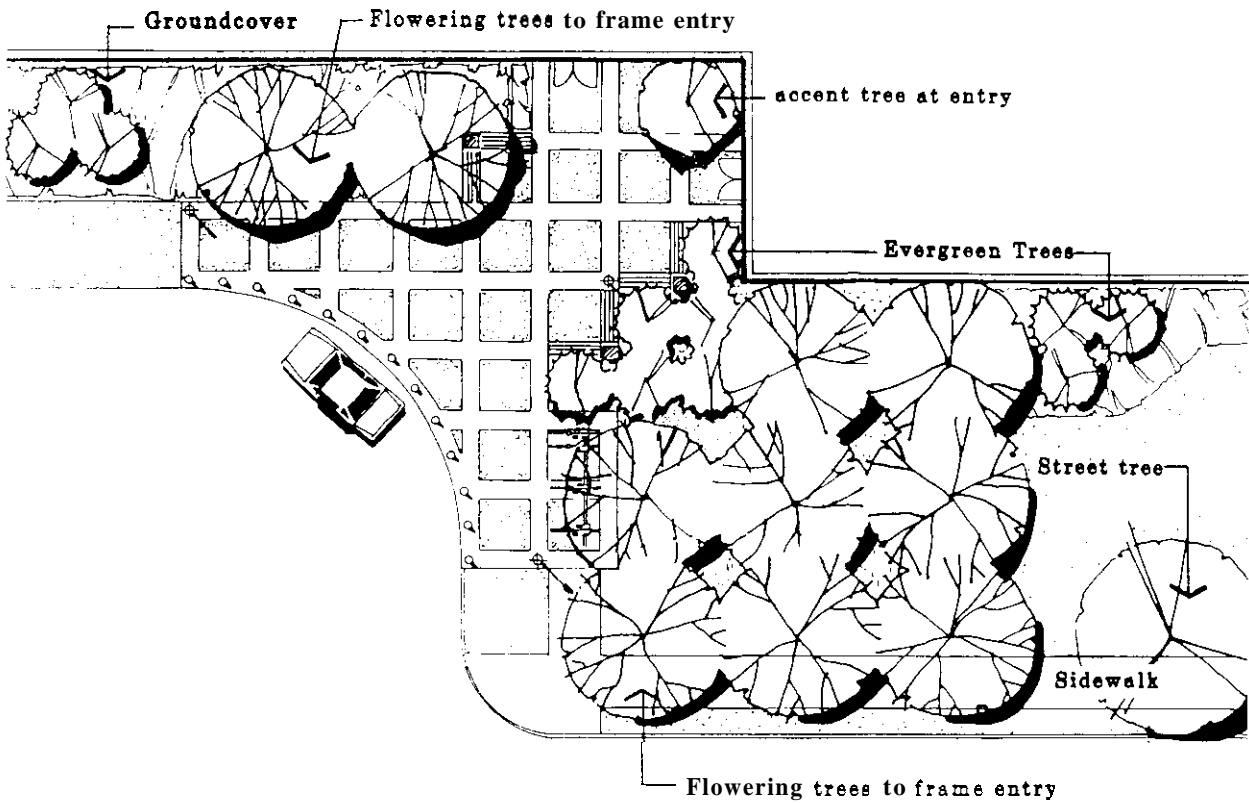
ENTRY PLANTING



Typical symmetrical major building entry planting

# LANDSCAPING

## ENTRY PLANTING



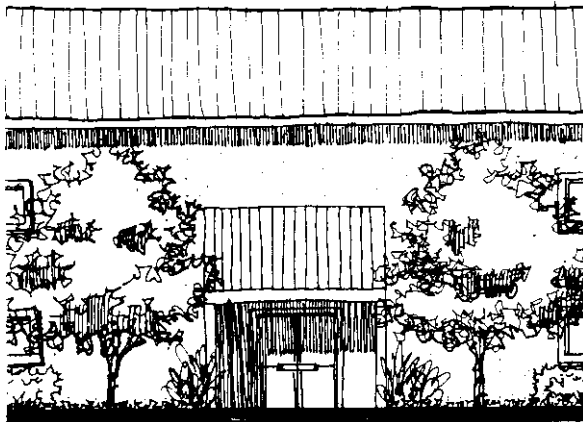
Typical asymmetrical major building entry planting

## LANDSCAPING

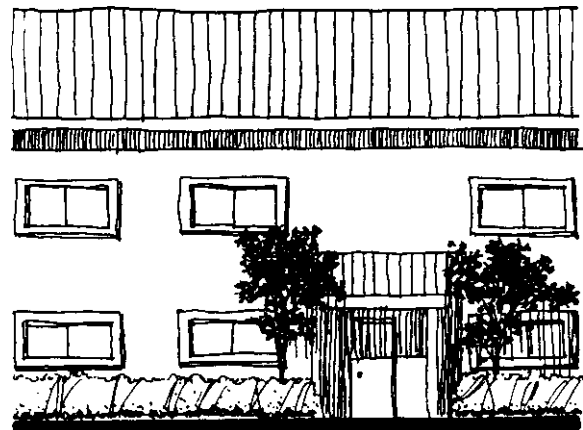
### ENTRY PLANTING

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Plants with a lot of visual interest are to be planted around entrances. Emphasis should be placed on primary entrances. Secondary entrances are to be scaled down versions of the primary entry treatment. The use of evergreens is encouraged at building entries.



Primary entrance planting



Secondary entrance planting



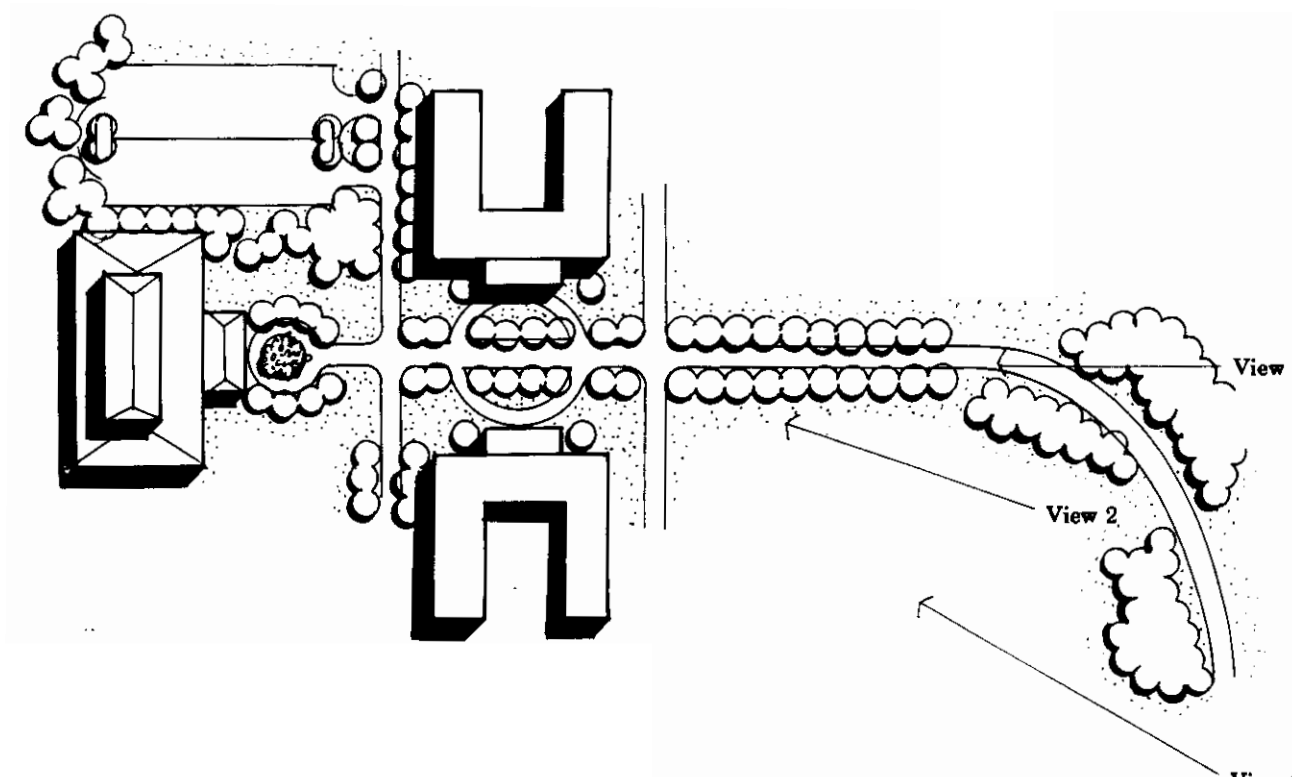


## LANDSCAPING ENTRY PLANTING

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Views 1 & 2—Planting should be planned to allow glimpses of Post buildings in an entry sequence.

View 3 concentrates on the primary building at the end of the avenue. The street tree planting enforces the processional quality of the space —giving added importance to the building at the end.



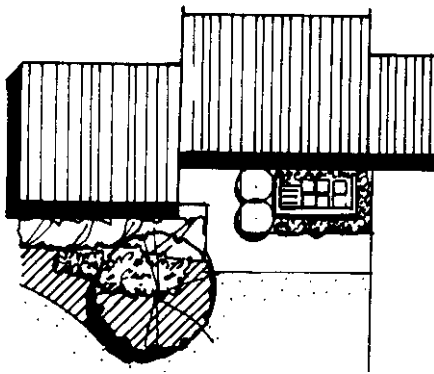
**Build a sense of arrival through plant material**

# LANDSCAPING

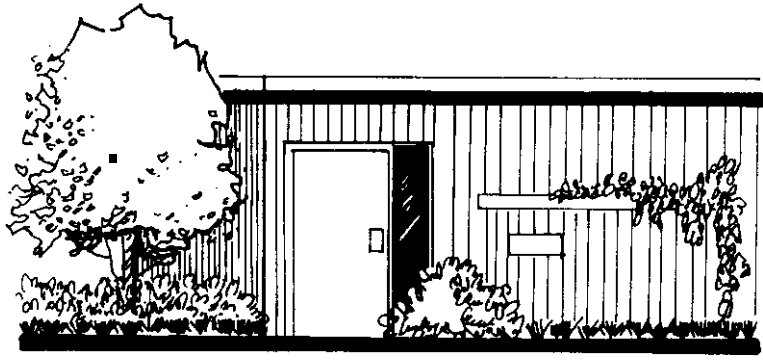
## ENTRY PLANTING

### Residential Plantings

Entry plantings in the housing areas are to direct the eye and the pedestrian to the front door. The entry walk and corresponding landscape should pleasantly welcome the visitor. The basic principles of planting design are to be generally followed; larger plants on the corners and accent planting at the entrance. Generally, coarse textured plants are located on the outside of the composition while progressively finer textures work their way inward. Evergreens will make up the major part of the composition. Deciduous plants may be used to add seasonal interest and color. Ultimate plant height and spread are to be considered during planning. The architecture of the building should not be overwhelmed by plant material. Plant varieties shall be kept to a minimum to satisfy the requirements and objectives of the design. By limiting the varieties of plants rather than cluttering the design with a planting mixture, clashing colors and forms are less likely to occur, and a unified composition will be created. Repetition with occasional contrast contributes to a successful planting design. Annual beds and sheared hedges require a great deal of costly maintenance and should be used sparingly in selected locations. The following illustrations show different approaches to the design and planting of entries.



Entry plan



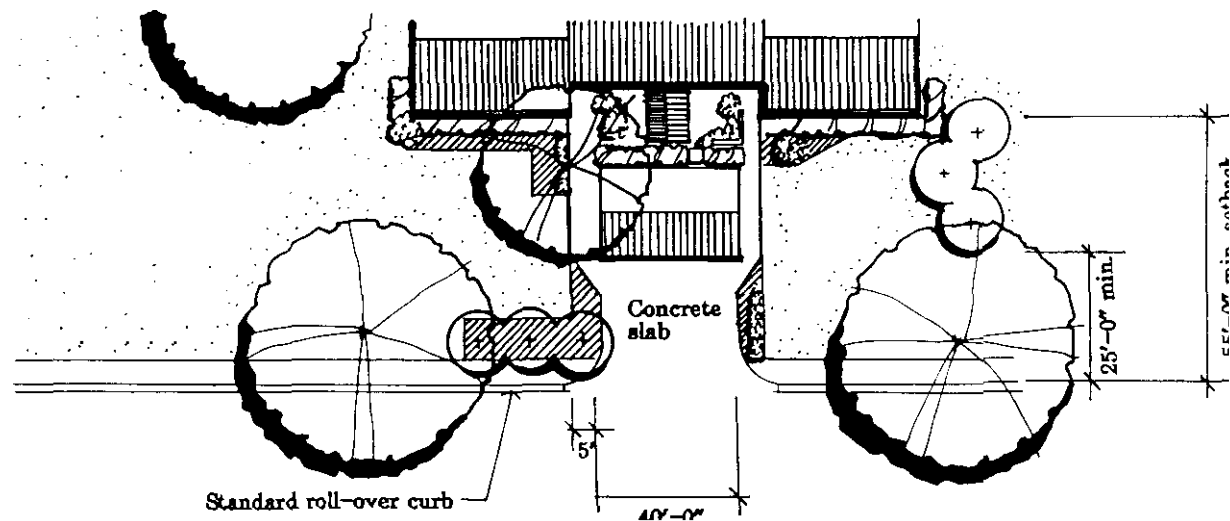
Entry elevation

Note: The ornamental tree provides a focal point for the entry walk. The screen creates a small private area protected from the street and adds another dimension to the house. Planting enhances the architectural character of the screen; the vine and groundcover or low shrubs mass below.



LANDSCAPING

ENTRY PLANTING

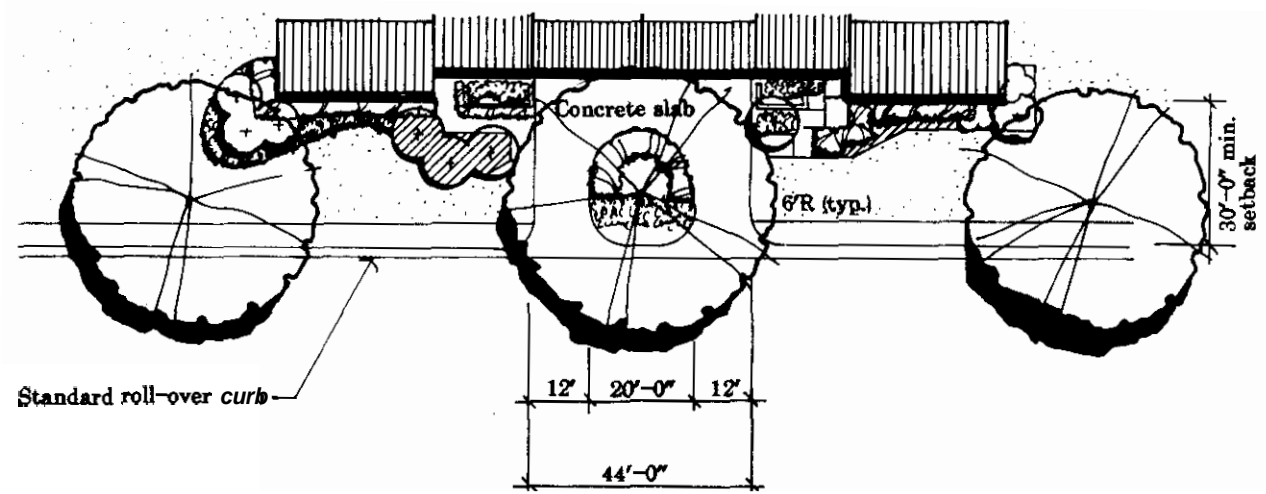


Duplex/detached carport

Note: The hedge between the carport and screen softens what would otherwise be a harsh view. The large tree shades the carport and large expanse of paving. Planting is kept simple. Shade trees frame the building from the street.

LANDSCAPING

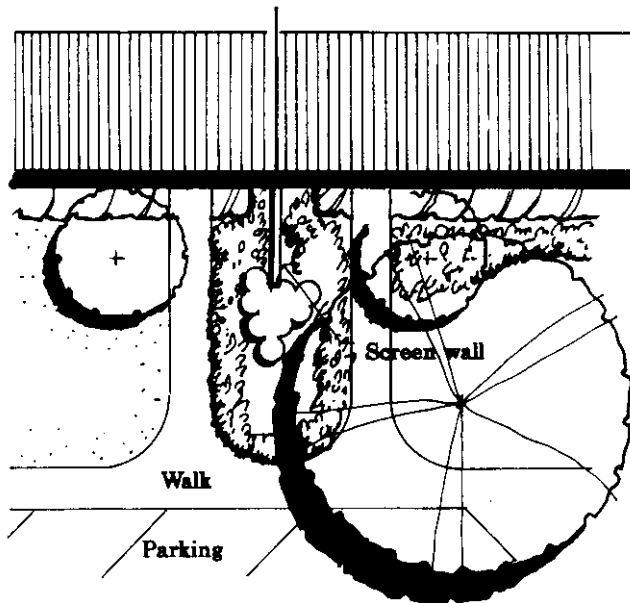
ENTRY PLANTING



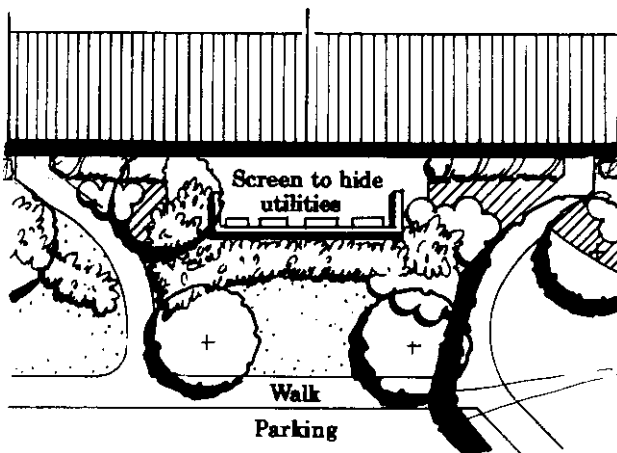
The above plan illustrates two different approaches to entry planting –one circilinear, the other rectilinear. The planted divider in the drive breaks up the facade of the duplex. The large tree provides shade to cool the paving. This design enables the street tree planting to go uninterrupted.

## LANDSCAPING

### ENTRY PLANTING



The screen wall on the divided walkway provides privacy between entrances.



The separate walks to the entrances are located as far away from each other as **pos**sible for privacy. Utility meters shall be located in back of the building. If this is not possible, the boxes shall be screened from view with an appropriate architectural element and planting.

Two entry approaches for attached housing

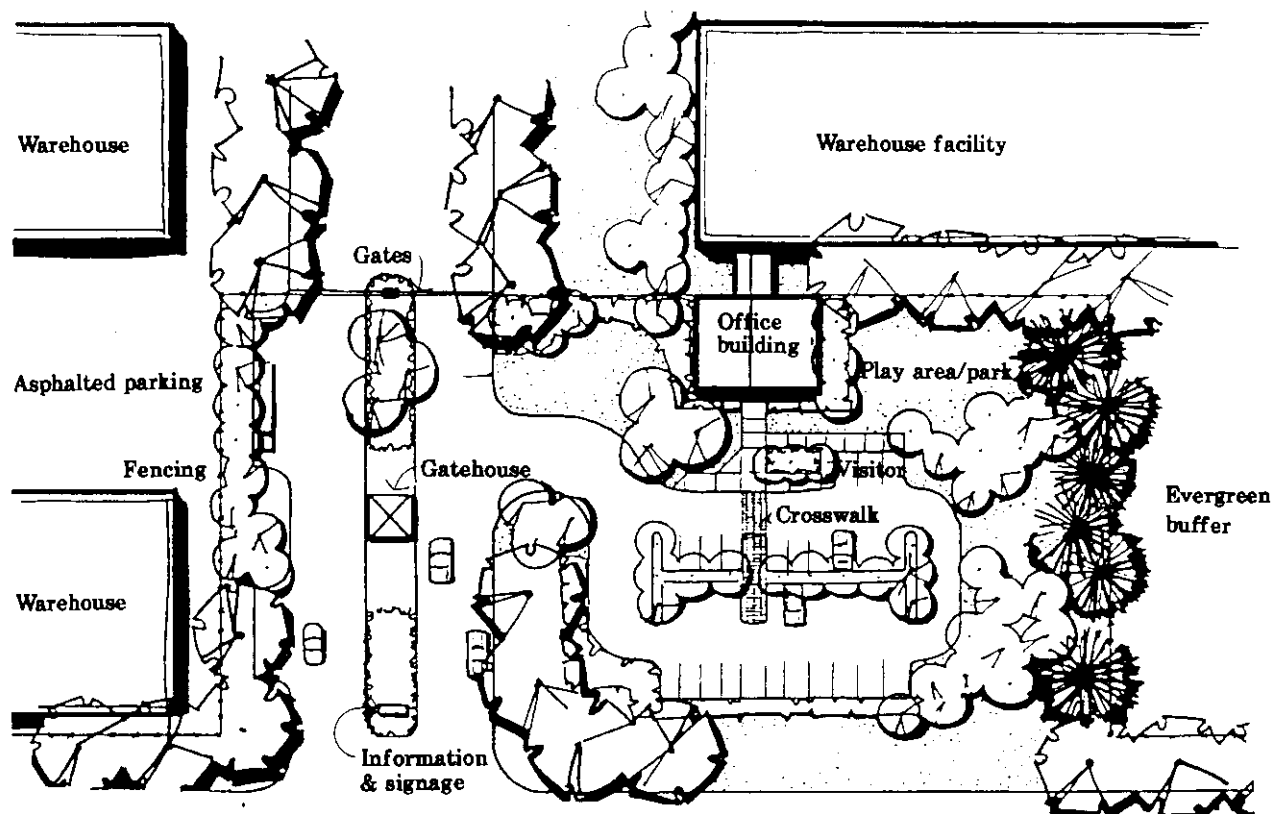


## LANDSCAPING ENTRY PLANTING

### Industrial Area Plantings

In the Industrial Land Use Zone, landscaping will be concentrated at major entrances, 100' either side of these entrances will be landscaped. The sign, gatehouse, and administrative office building will receive extensive landscape treatment, while the perimeter fences and walls of the industrial areas will be landscaped to buffer this zone from adjacent zones.

The office building will have its own parking lot with ample visitor parking, all screened from major streets. The entry to the major office buildings will be well defined by plant and paving materials. Large and small trees are to spatially define the vehicular and pedestrian entrances and also provide screening. Trees will be used to soften boundary fencing and buffer the large industrial/warehouse facilities. Outdoor park areas are to be incorporated into the design to provide an active and passive recreation area for workers in the vicinity. The industrial area is secured with an appropriate fence or wall which may be softened with landscaping if necessary.

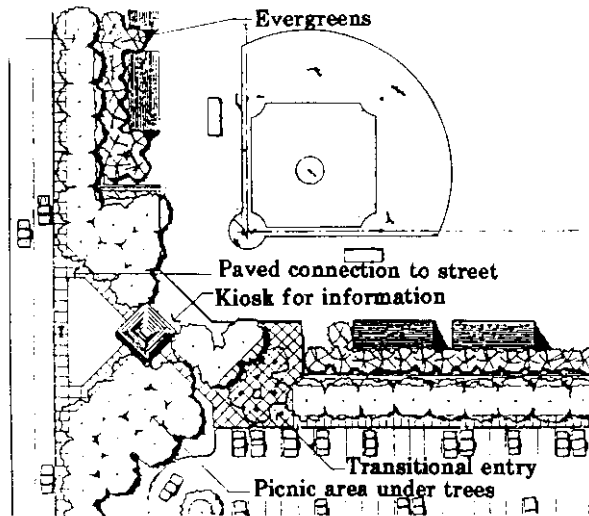


Major industrial area



# LANDSCAPING

## ENTRY PLANTING



Open space/intense use

### Open Space Plantings

Open space encompasses many situations. Generally these may be grouped into active-intensive use areas and passive use areas. Landscaping in an intensive use area requires more paving, because of pedestrian activity. Planting will define and soften the paving and provide the transition between the man-made hardscape to open space. Trees and grass will be used extensively in this zone, because of ease of maintenance. Evergreen landscape material or other architectural treatments are to be used to block or screen objectionable or undesirable views. A mixture of deciduous and evergreen plant material is an effective wind break which may be incorporated into a design as required.

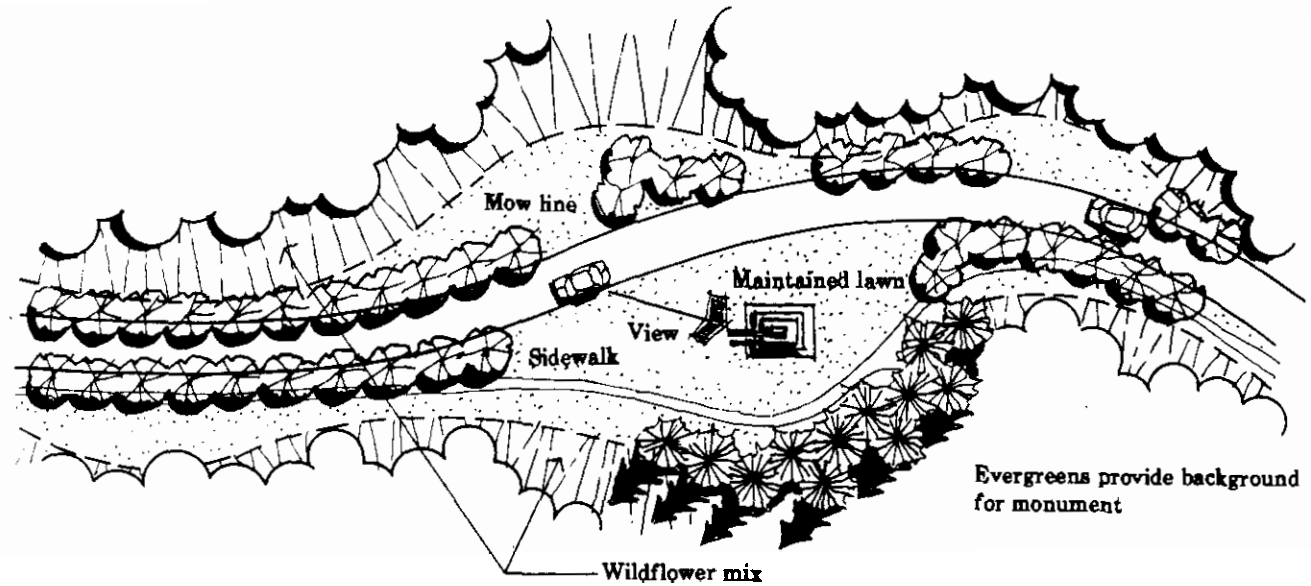


## LANDSCAPING

### ENTRY PLANTING

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In passive use areas, landscaping will provide the transition from the man-made environment to the natural environment. Large and small trees, flowering trees, grass and the proper wildflower mix will be used to provide this transition. Plantings are to be massed with the distance between the masses providing ample space for maintenance vehicles.



Open space/passive use





# LANDSCAPING

## FOUNDATION PLANTING

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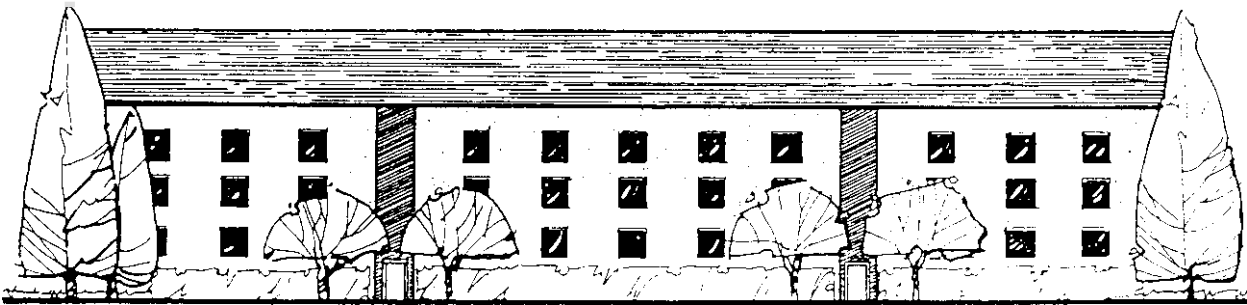
### Foundation Plantings

Foundation plantings are used to create a setting for the building. They are also used to hide unattractive foundation treatments and utilities such as vents or transformers. Plants soften the hard lines of buildings and help to unify them with the rest of the landscape.

The following principles are to be followed when designing or maintaining foundation plantings:

- oPlants shall be set forward from the building walls to allow adequate air flow and prevent root damage to the foundation.
- oLarge Trees shall be located at least 18 feet from building walls.
- All other plants shall be planted an adequate distance from the building wall to permit maintenance access after the plants have reached mature size.
- Foundation plants shall have a growth habit that will not interfere with building functions by blocking windows, doors, growing into the eaves, or by damaging the foundation.
- Evergreen plants generally make a more pleasing foundation planting than deciduous plants. Deciduous plants should be used sparingly.
- Foundation plantings are to be neat and orderly, in scale with the building and complementary to the entry plantings.

The elevation below illustrates both simple entry and foundation treatments.



Typical foundation planting



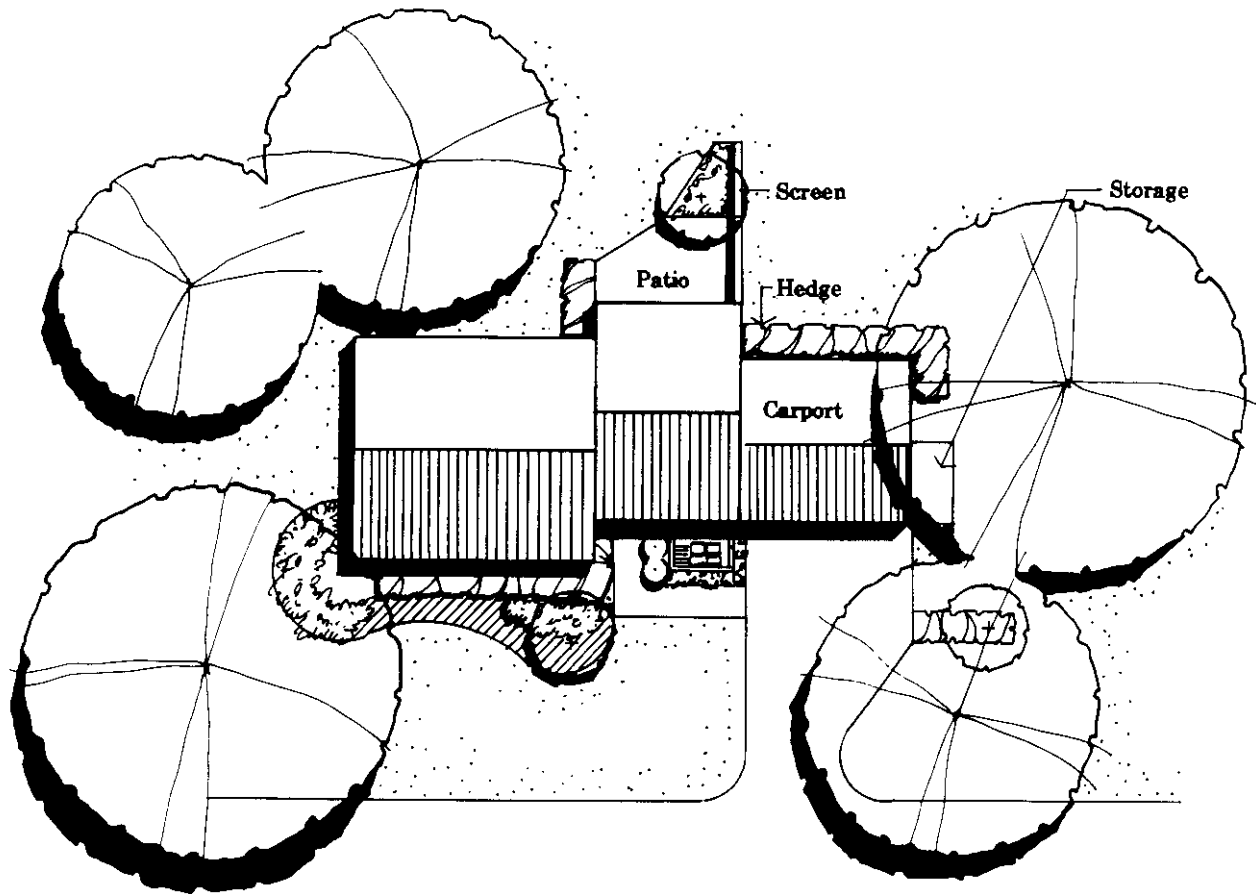
## LANDSCAPING

### FOUNDATION PLANTING

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Landscaping in housing areas is to concentrate on fronts and entries. Other planting is to be functional **as** well as aesthetic in nature. The trees in the plan below provide shade, some privacy and frame the structure. Notice that hedges and screens give privacy to the patio which will be required for every housing unit.

In order to preserve the street tree planting rhythm in housing areas, trees should be planted along the street in such **a** manner as to frame the house. Sections of neighborhoods and house spacing should be analyzed when determining tree placement.



## LANDSCAPING

### STREET & SHADE TREES

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#### Street Trees

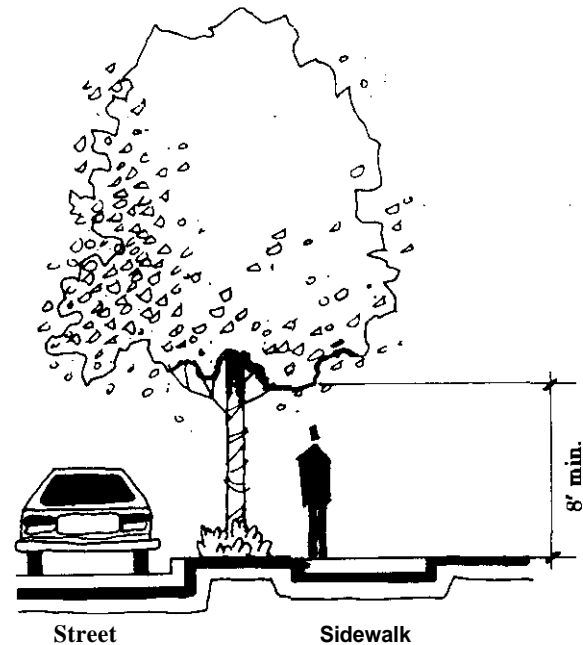
The use of street trees in the landscape improves the visual image and environmental quality of the Installation. Trees have the greatest impact on improving visual perception of previously developed areas on Post. Street trees provide shade and scale, define corridor space and help limit unsightly views.

Mature height, spread, shape, texture, mass and light requirements are all features to consider when selecting a street tree. Large trees, whose broad spreading canopies create a sense of enclosure, make the best street trees. Small or columnar types of trees shall be used as street trees only where specific site limitations exist, such as a narrow space against or between buildings.

Street tree branches shall have a minimum clearance of 8 feet from the ground surface, 12 feet where truck traffic is heavy, and shall avoid interference with overhead utilities.

It **is** recommended that trees shall be planted **4** feet from the edge of the road or sidewalk. Street trees can be located in a planting strip between the road and sidewalk or behind a sidewalk that is adjacent to the road.

Street trees should be planted with regular spacing. Gaps in planting due to the removal of dead or damaged trees should be replaced with the same variety as the tree that was removed. The spacing of trees shall be coordinated with driveways, walks, site furnishings and street lights.



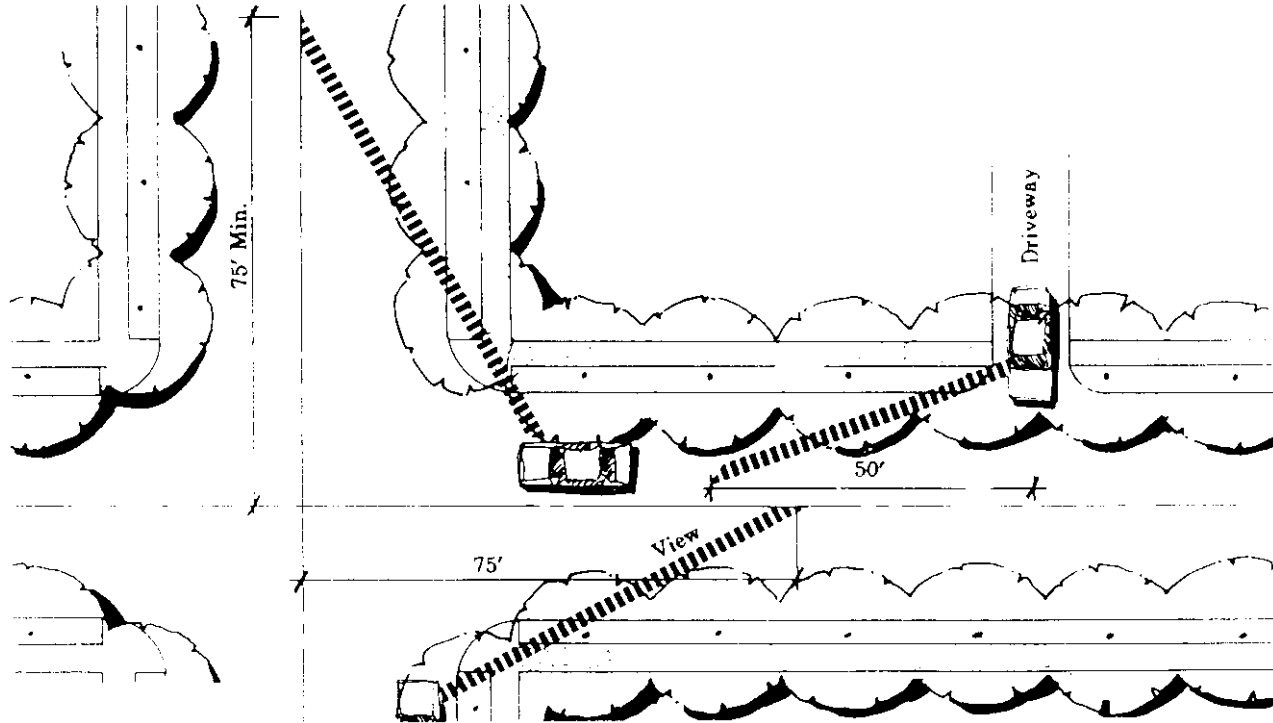
Typical street tree planting



## LANDSCAPING

### STREET & SHADE TREES

Field of vision at intersections will not be blocked by tree trunks. Street trees will be arranged to allow the driver at least a 75 foot view in both directions. At exits, trees along the street should be located far enough from the driveway to allow a driver to see at least 50' in both directions before entering the street,



Entries and sightlines

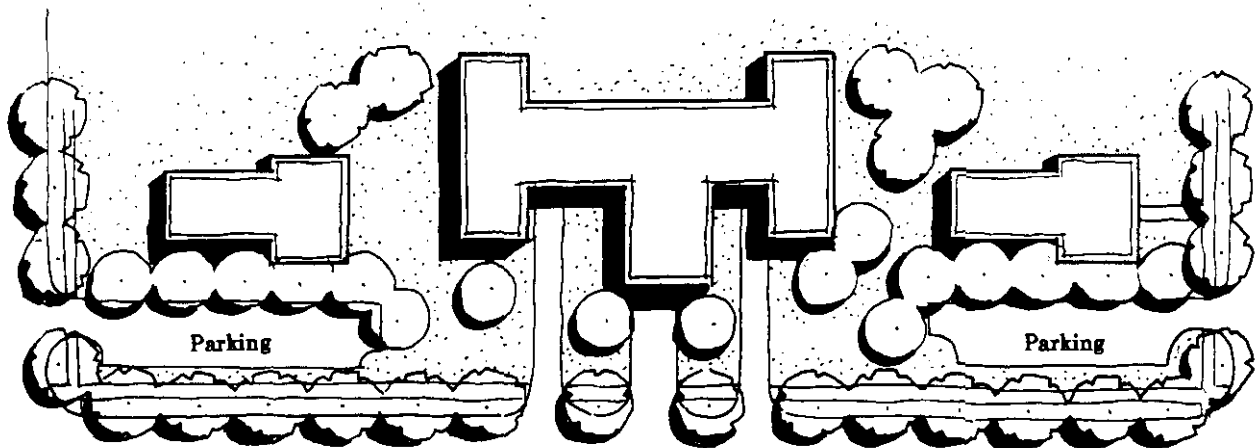
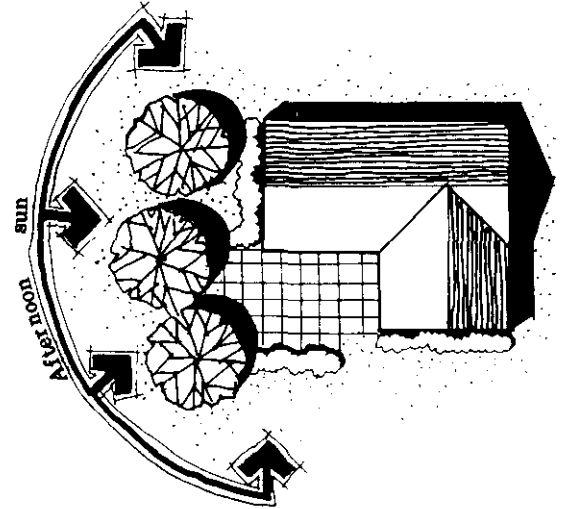


## LANDSCAPING

### STREET & SHADE TREES

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Shade trees are to be selected on the basis of their mature height, spread, form, color, texture, and their neatness. Large shade trees will be located on SW, W, and NW sides of buildings and large paved surfaces. Large trees are to be located a minimum of 15' from buildings; small ornamental trees are to be planted a minimum of 8' from buildings.



The regular spacing of street trees will be maintained along roads; other trees can be used to frame the building or direct views. Smaller trees can then be used to screen and add visual interest; becoming part of the foundation planting.



## LANDSCAPING

### STREET & SHADE TREES

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#### Plant Hierarchy

##### PRIMARY

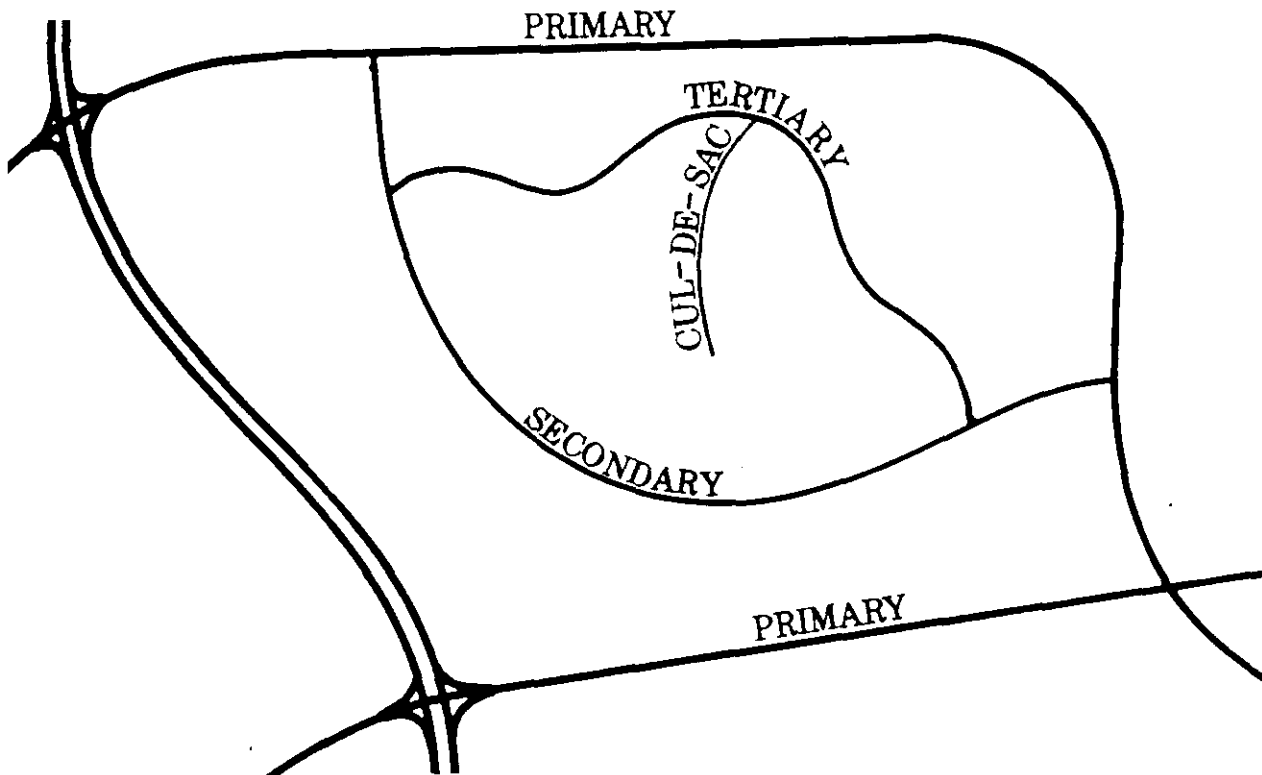
Primary roads will have a structured tree planting scheme. This will give the road system an added sense of hierarchy. Trees should not be spaced greater than 30' apart.

##### SECONDARY

The designer will determine the proper tree plantingscheme on secondary streets. An overall sense of enclosure will he maintained, although breaks for views and openings will add variety.

##### TERTIARY/CUL-DE-SACS

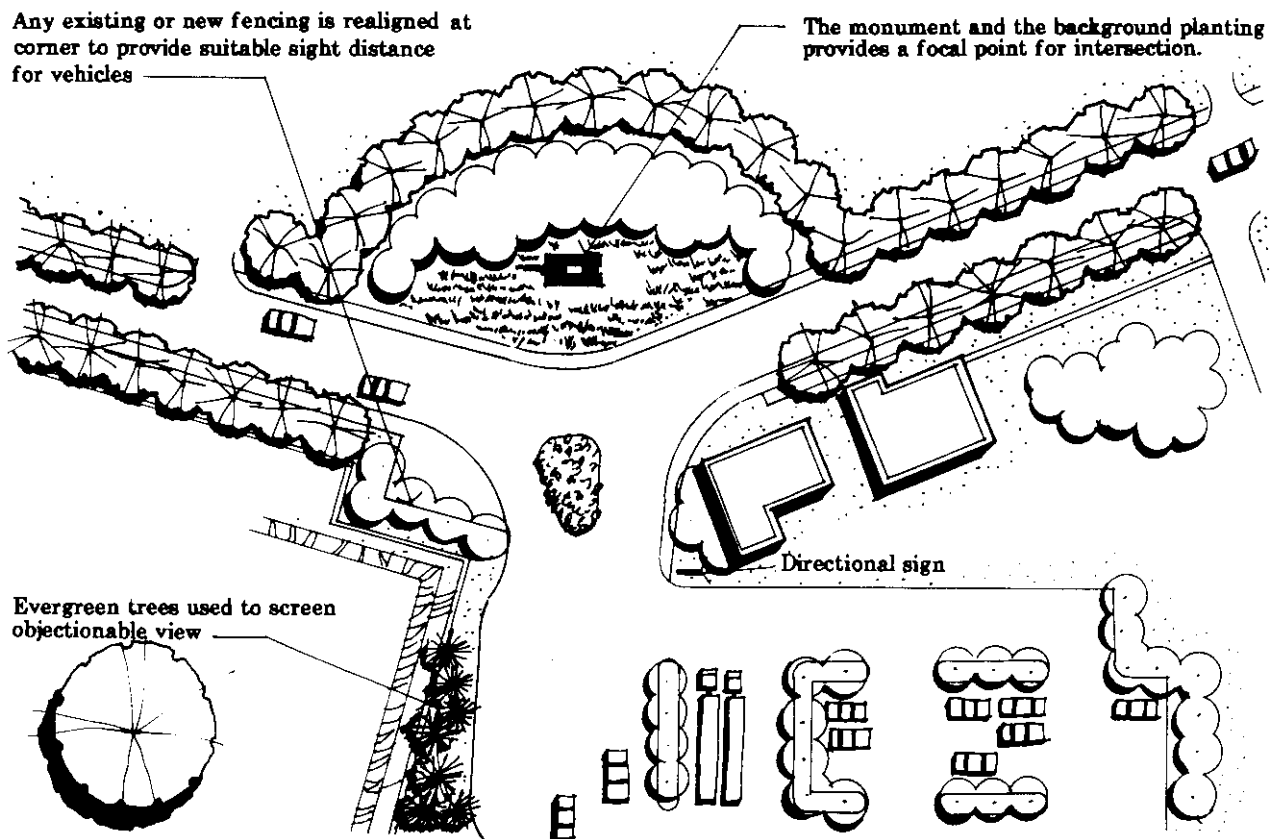
On tertiary streets and cul-de-sacs, the trees which will be planted to frame and shade the houses will form the basis of the green belt system. The designer will determine those areas where street trees will benefit the visual environment of the neighborhood.



## LANDSCAPING INTERSECTIONS

### Intersections

Since roads are a primary vantage point along which most people see the Post, the high visibility intersections deserve landscape treatment. Besides landscaping, intersections may provide a place to display monuments. Planting may function as a backdrop for these pieces. Vehicular and pedestrian safety is the primary concern. Landscape will not block crucial sight lines.



Typical highly visible intersection planting



## LANDSCAPING

### SIGNAGE PLANTINGS

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#### Signage Plantings

A sign's basic purpose is to communicate information in a clear and concise manner. Signage should be attractive and in harmony with its surroundings. Landscape plantings shall be used to emphasize important signs such as Post Headquarters, major community facilities and administration buildings as well as directional signs. Signage may be placed on a berm to increase visibility. Groundcovers or low shrubs that will not interfere with the visibility of the sign are to be used at the sign's base. Trees and larger shrubs may be incorporated into the planting bed behind the sign if there is enough space and if they will complement adjacent plantings. Any accent lighting must be coordinated with the planting.



**Berm improves visibility**



**Planting highlights sign**





# LANDSCAPING

## SCREENING

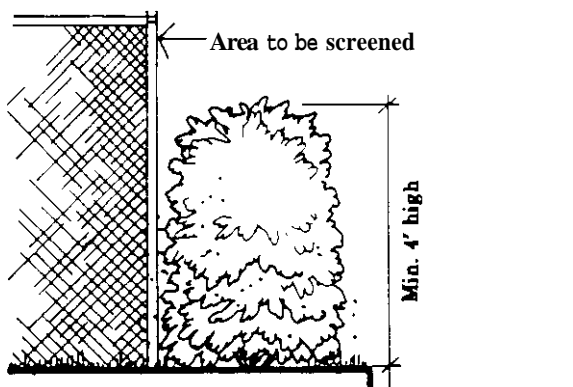
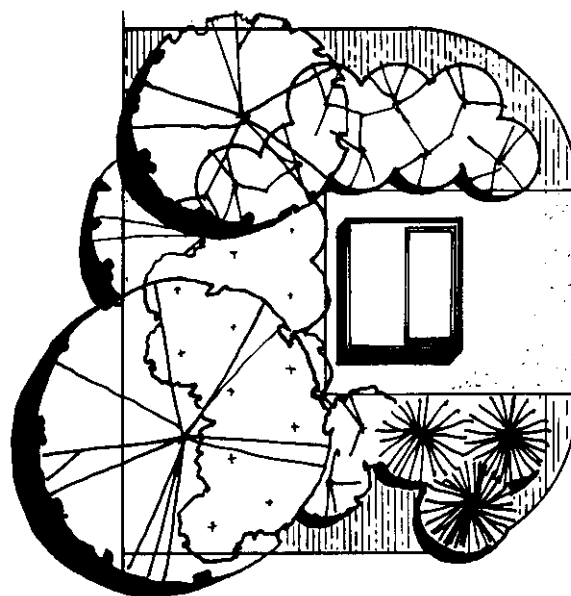
### Screening

Screening techniques shall be used to block undesirable views to separate incompatible uses and to add privacy. Vegetation will be used as the primary method of screening on Post. Berms can be used but their use must follow guidelines as specified in this section. Architectural screens by themselves or in conjunction with plant material will be used where instant effect is necessary or where space precludes the use of alternative screening techniques.

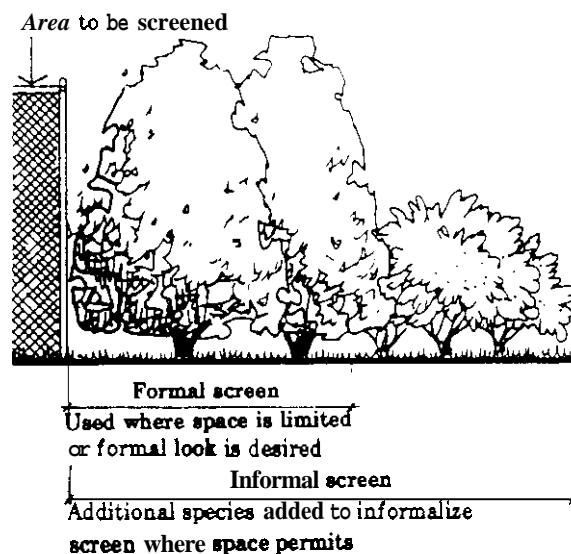
Vegetative screens can be a combination of a variety of plant types. A single row of trees shall be avoided where possible. The traditional hedge is a formal screen, but screens can also be composed of large and small trees and a variety of shrubs.

The design criteria for screening is based upon the desired result, whether the object must be entirely blocked from view or visual separation only is to be implied by plant materials.

This screen uses a variety of plant materials in an "un-hedge" manner. Evergreen shrubs and trees make up the backbone of the planting, smaller flowering trees and large trees give added interest. A single row of shrubs should be avoided when adequate space exists to establish a more varied planting.



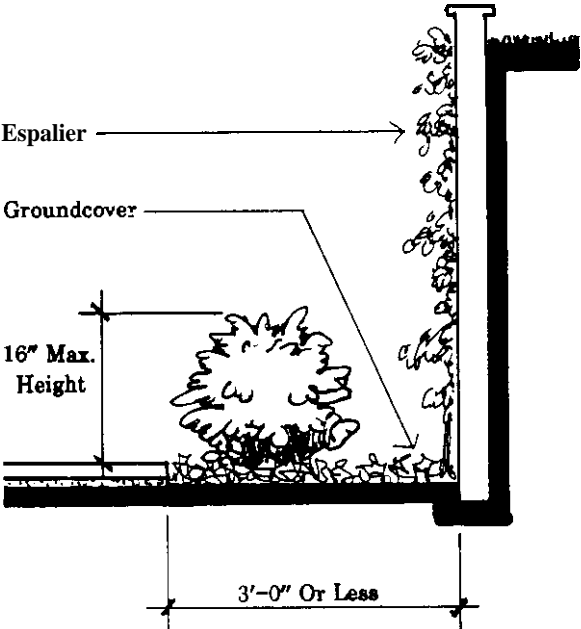
Typical evergreen hedge screen



Typical evergreen tree screen

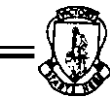


# LANDSCAPING SCREENING



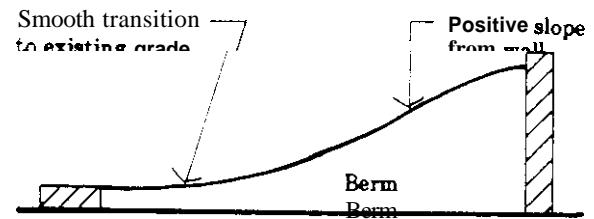
In areas where there is not adequate space to form a vegetative screen, the appropriate wall shall be used. Shrubs can soften the wall. Contained spaces of less than 3' will not be planted in shrubs unless they are to be espaliered, or if their mature height is 16" or less. Groundcovers are appropriate in these areas.

Due to expense of construction and cost of maintenance, walls should be used only in high visibility areas where necessary.



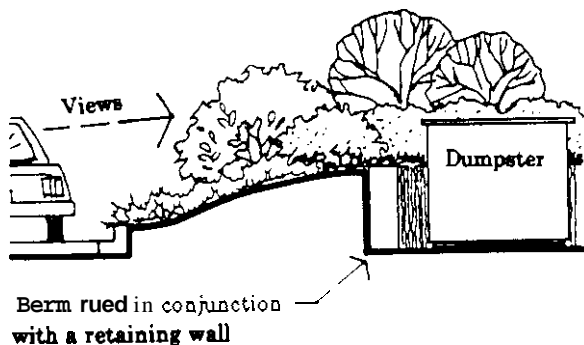
## LANDSCAPING SCREENING

Berms shall be a minimum of 3 feet in height. They shall have a maximum slope of 3:1 and a minimum slope of 5:1. Evergreen shrubs and/or deciduous trees will be planted below the ridge of the berm for a year-round screen. Deciduous plants may be added for seasonal interest. Groundcovers shall be used on the lower portion of berms and around open green spaces. Wildflowers can be used in natural areas.

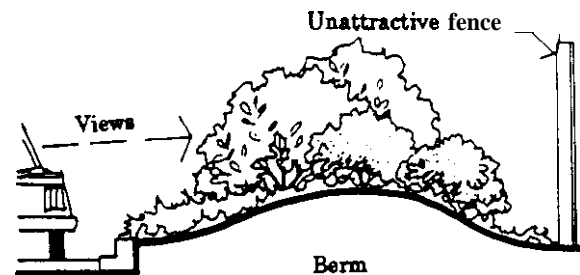


Section of typical berm

Berms are to be used to screen unattractive fences in high visibility locations, service areas, dumpsters and utilities. They may also be used as a sound barrier.



Berm and vegetation screen of dumpster

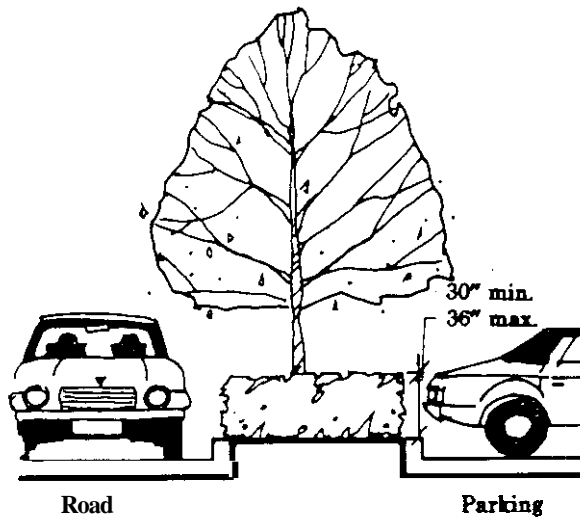


Berm and vegetation screen of unattractive fence

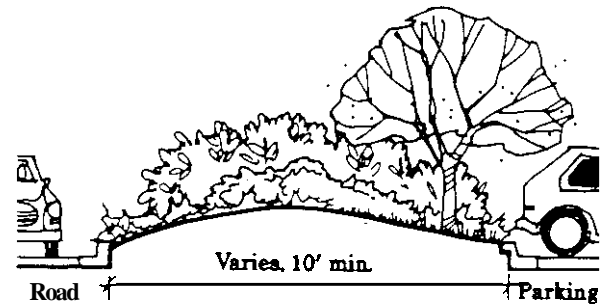


## LANDSCAPING SCREENING

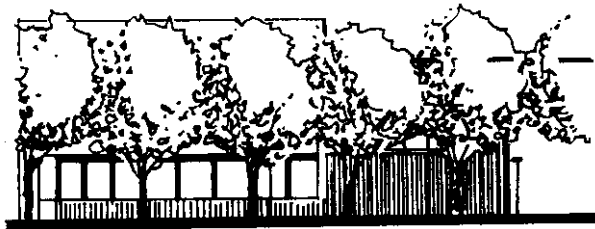
All parking should be screened where possible. Parking can be screened with vegetation or a combination of vegetation, walls or berms. To screen the most objectionable portions of automobiles the vegetative screens minimum height is 30 inches and the maximum height for security and aesthetic reasons is 36 inches.



Parking screen with berm and vegetation



Parking screen with vegetation

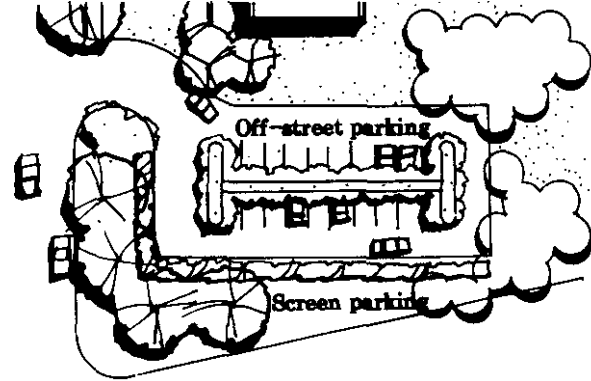


Architecturally objectionable buildings can be screened with trees. The screen will not hide the building entirely but it will add an interesting pattern of branches and foliage in front of it.

## LANDSCAPING SCREENING

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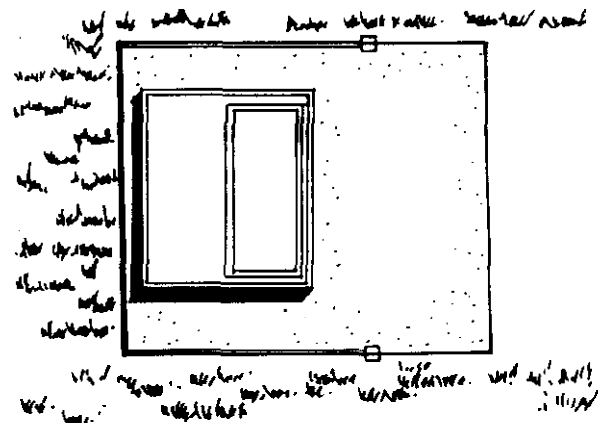
Shrubs and/or trees can effectively buffer parking lots from streets and walkways.



In some areas on Post, the screen/fence by itself is an appropriate solution, such as in low visibility, service and industrial areas.

Decorative wood or slatted chain link fence is recommended in this situation.

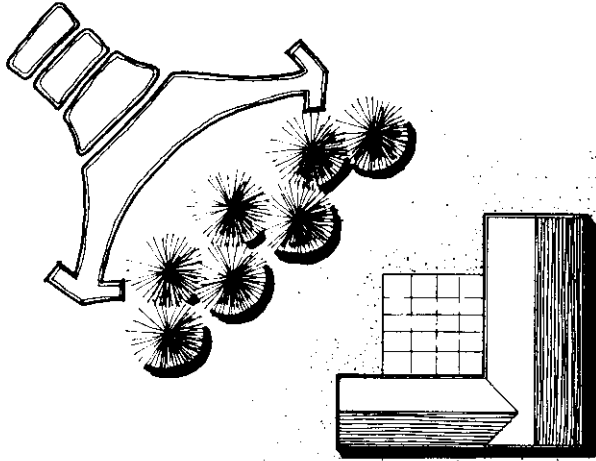
Above ground petroleum storage tanks of 500 gallons or less shall be screened through the use of a fence or wall, and when possible should be supplemented by landscape plantings.



## LANDSCAPING

### SCREENING

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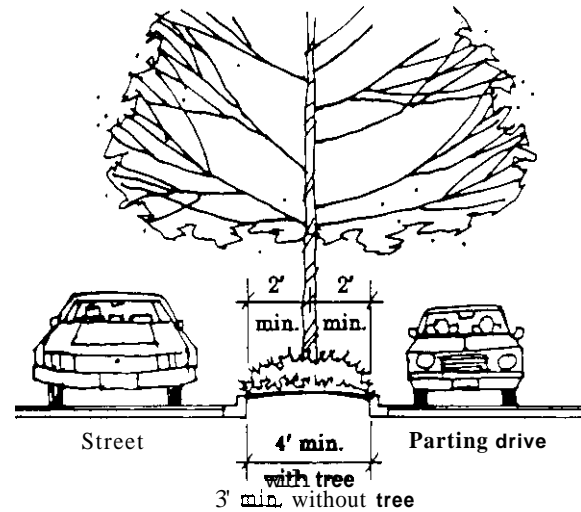
Another type of screening is that of protection of buildings or outdoor gathering spaces from winter winds. Typically these cold winds come from the northwest. Coniferous evergreens that branch to the ground are the most effective plants for winter wind control. Massing this type of plant material to the northwest of a building or outdoor space will block a considerable amount of wind thereby aiding in the energy conservation of the building or creating a more comfortable gathering space.

## LANDSCAPING PARKING LOT PLANTINGS

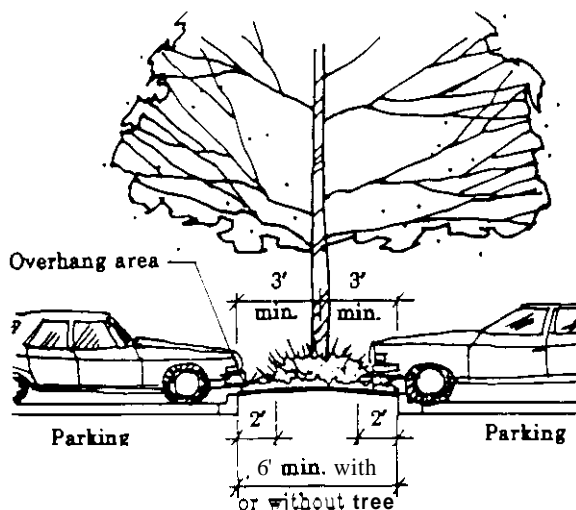
### Parking Lot Plantings

Landscape plantings in parking lots provide screening and shade while reducing noise and glare. The correct plant type, either tree, shrub, groundcover or turf must be carefully chosen when preparing a parking lot planting.

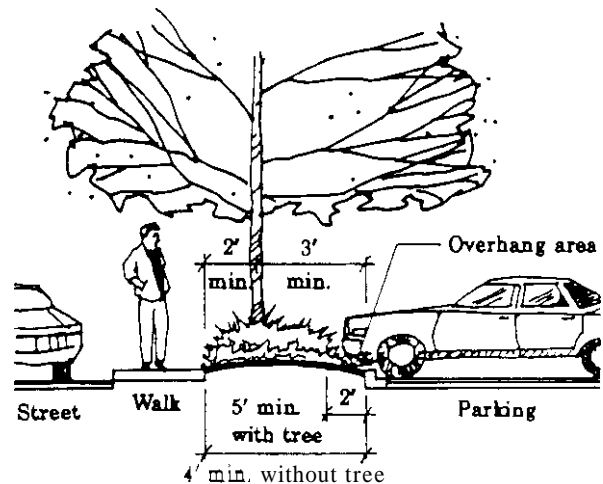
Trees are to be used where shade is desirable and space allows. Trees require at least a 4 foot width to allow room for proper planting of the root ball; more space is desirable and sometimes necessary. Shrubs are to be used for screening and control of pedestrian traffic. They may be used only when there is sufficient room to allow them to fill out naturally; dwarf varieties will be used most often. Groundcovers, due to low maintenance requirements, are an excellent choice to use in vehicle overhang areas (2 feet wide) where pedestrian traffic is not heavy.



Section of planting strip with no automobile overhang



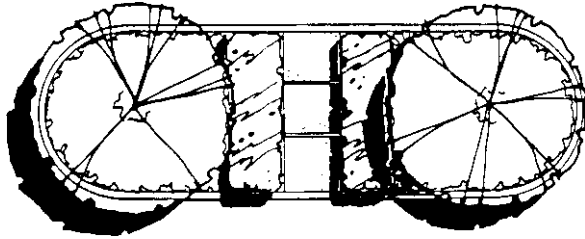
Section of planting strip with automobile overhang on both sides



Section of planting strip with automobile overhang on one side

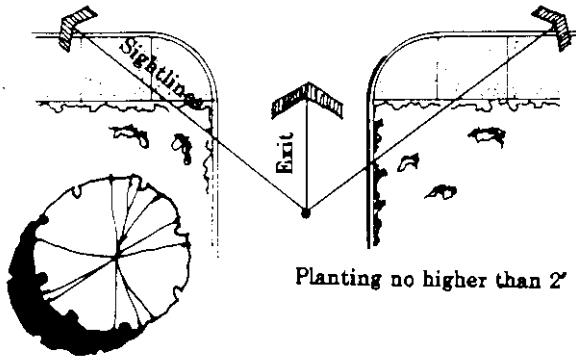


## LANDSCAPING PARKING LOT PLANTINGS



Typical island planting with pathway

If pedestrian traffic crosses the planting area, the design should provide for a barrier to direct people around the island or a defined pathway through the island.



Entries and sightlines

It may sometimes be appropriate to use additional landscaping to accent parking lot entries. Landscape materials must not block vehicular sightlines at entries and exits.

Specific plants to be used in and around a parking lot must be chosen with care. Trees in these paved areas must be able to withstand harsher conditions than lawn trees because of the heat radiating from paved surfaces, and a reduced water supply. Trees shall not produce excessive litter, flowers, fruits, nuts or leaves and must not cause a hazard to vehicles or pedestrians. Shrubs must not grow too large, thus becoming a maintenance problem.

Groundcover must be able to withstand occasional foot traffic and turf must be able to withstand a great deal of foot traffic.



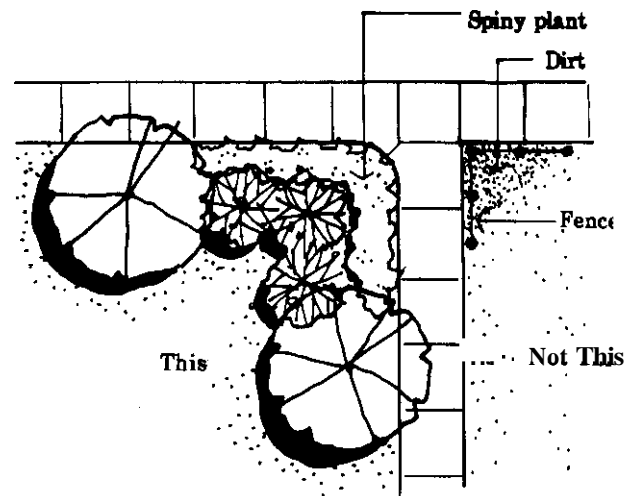


## LANDSCAPING

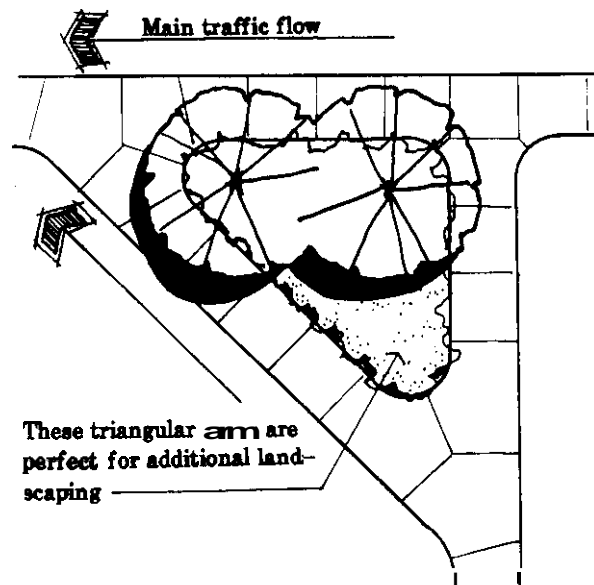
### PEDESTRIAN CONTROL

#### Pedestrian Control

Planting in conjunction with paving can help direct pedestrian traffic. If planting is employed, a spiny-thorny plant would be appropriate to deter people from entering the planted area. Traffic flow should be considered before installing paving and planting. Paving should coincide with pedestrian routes.



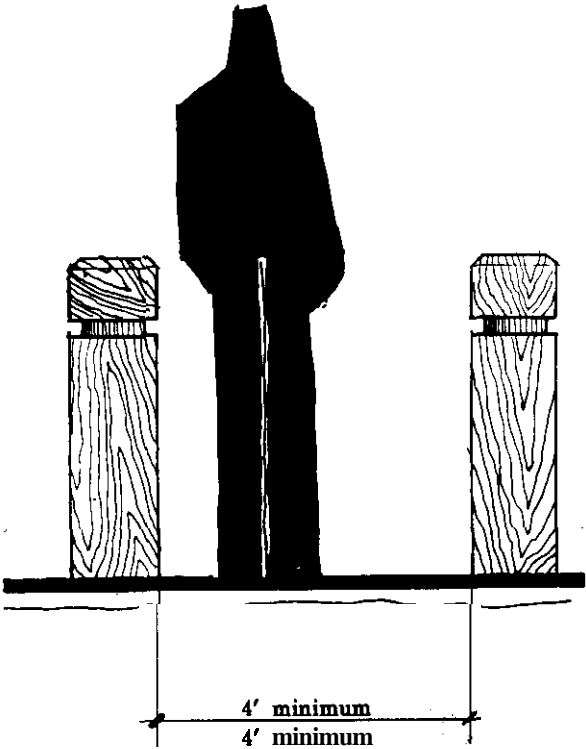
The sidewalk should follow the direction of the pedestrian path.



These triangular arm are perfect for additional landscaping



**LANDSCAPING**  
**PEDESTRIAN CONTROL**



In areas where protection for pedestrians is desired the wooden bollard is to be used. See 5.10.1

However, single bollards are not to be used to amplify the intersection of pedestrian walks.

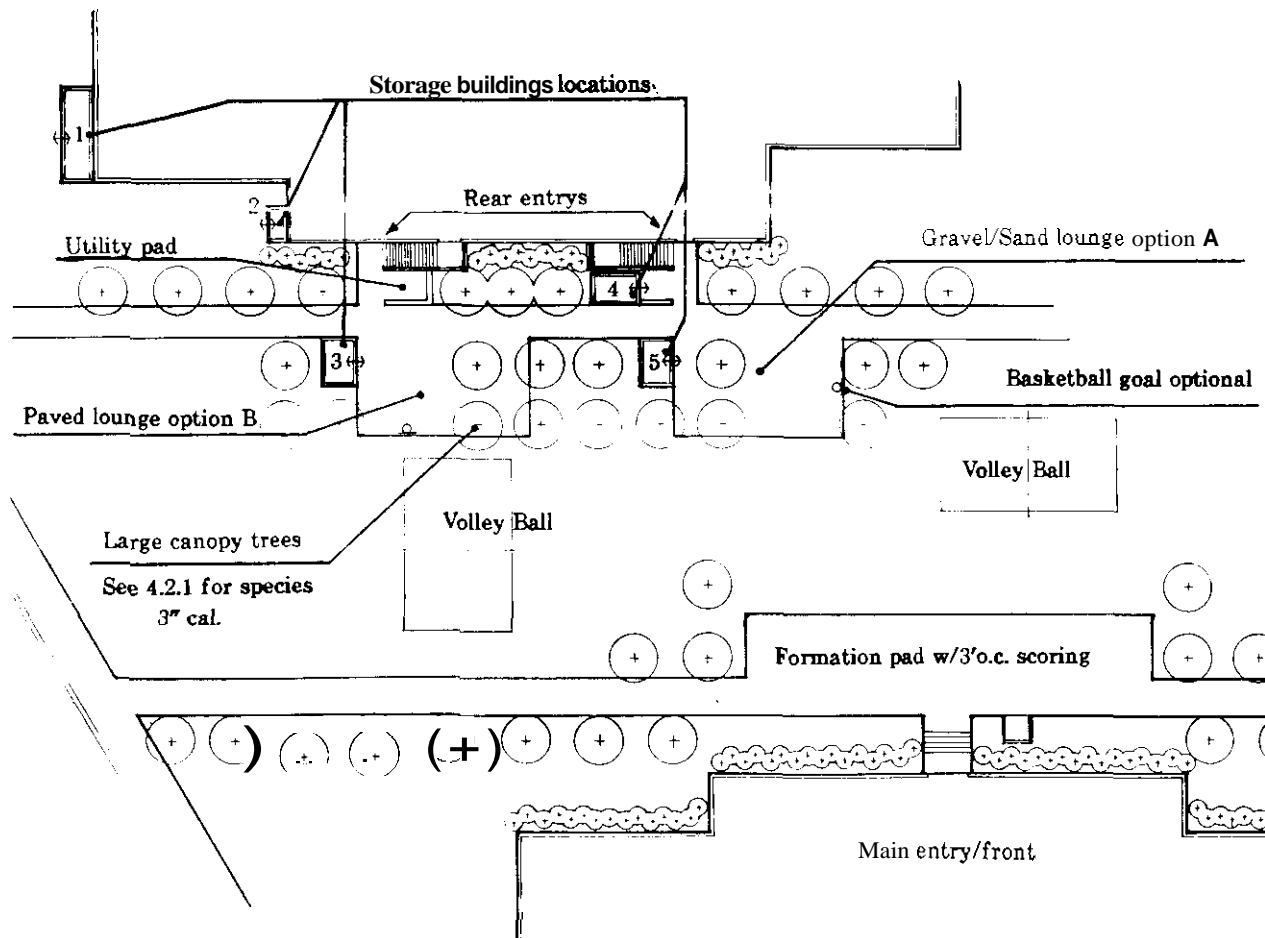


## LANDSCAPING OUTDOOR LOUNGE AREAS

### Outdoor Lounge Areas

The outdoor lounge areas in the troop barracks areas will be standardized to provide an aesthetically pleasing passive use area. Walks in the Mission Support areas will be at least 10 feet wide. A standard 12x90 foot concrete pad is added to provide a place for unit formations. The lounge areas will be at least 50 x 22 feet with the option of being enlarged to 70 x 22 feet.

Two location options are shown in the rear areas of a standard barracks building. Trees and optional storage buildings should be located to provide shelter/shade from the south and western sun. Lounge areas may be covered with a variety of materials such as concrete, gravel, brick or precast pavers and they shall be edged with a complementary material. Walls and fences (maximum height permitted is 3'0") shall be constructed in accordance with the designs and materials as shown in Site Furnishings, Sections 5.3.1 & 5.4.1.



Typical lounge area options



## LANDSCAPING REFORESTATION

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### Reforestation

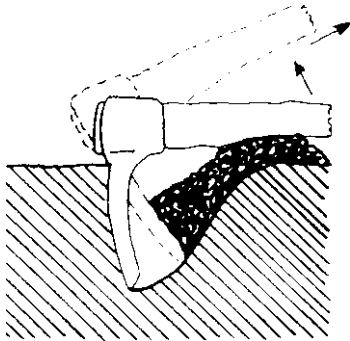
The field planting of pine and or hardwood seedlings is one way of regenerating land. When selecting species, the indigenous plants of the area should be considered first. The staff forester should be consulted in all stages of reforestation. The following are general guidelines.

Site preparation is important in reforestation efforts. 'Roundup' or other similar herbicides, will eradicate the area of competing vegetation. Loblolly pine (*Pinus taeda*) is a commonly used pine for reforestation. It will take approximately 1200 seedlings per acre if planted 6' on center. Seedlings may be machine or hand planted and for best results they should be planted in the fall. Competing vegetation may have to be removed at least once during the first year growth; this should be supervised by the staff forester. After seven years, controlled burns may be used for unwanted vegetation control.

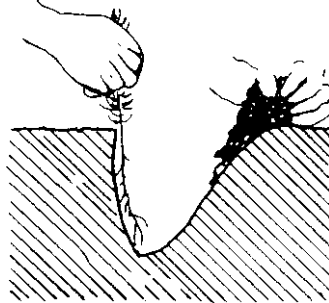
Due to their rapid growth and the relative ease with which they can be planted, conifers are likely to remain far more important than the hardwoods in planting. Planted hardwoods do not thrive on sites of abandoned agricultural land covered with grass and other herbaceous growth. Sometimes the best way to create hardwood stands is to plant conifers and then wait for the natural succession of a deciduous understory. This procedure may be desirable to forestall the development of the stands of poorly formed trees that often appear when hardwood species slowly recolonize grassy areas. Hardwood plantations can make satisfactory growth on barren areas created by erosion, recent cultivation, site preparation, or the deposition of overburden from open-pit mining. They will also grow well on cutover lands and brushy areas that are free of grass, provided that the competition of shrubs and coppice shoots is kept under control.



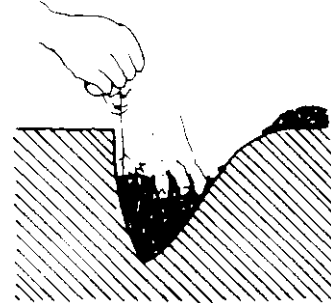
## LANDSCAPING REFORESTATION



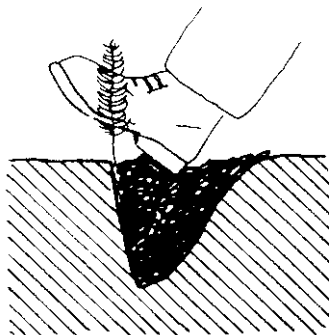
1. Drive grub hoe into ground, lift handle, and pull hoe back.



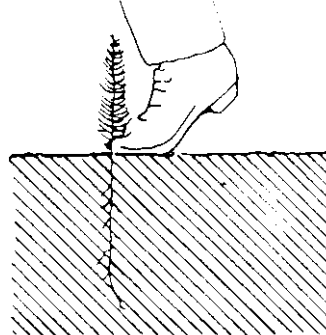
2. Place seedlings against straight side at correct depth.



3. Fill bottom of hole and pack soil against roots.



4. Finish filling in soil and pack it with heel.



6. Firm around seedling with the feet.

Side-hole method of hand planting



# LANDSCAPING INSTALLATION

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## General Information

All newly planted trees and shrubs and all other plants that are not intended to spread by seed, rhizome, stolon, division, or other means shall have landscape fabric placed on the top surface of the planting *mix* beneath the mulch. The fabric controls weeds and unwanted spreading of the plants and therefore reduces maintenance.

## Lawn Establishment

The establishment of quality lawn areas is important in high visibility locations at Fort Jackson. Correctly installed lawns will be more vigorous and will require less regenerative maintenance. The location of the turf area and the time of year will determine whether seed or sod shall be planted.

Seed can be successfully planted in the Mid-Atlantic area from August through mid October. A second opportunity to plant grass seed occurs between mid March and late April, but fall is the best time to plant. A spring planting will be less vigorous with many more weeds and there is always a risk that a warmer than normal summer will kill the new seedlings.

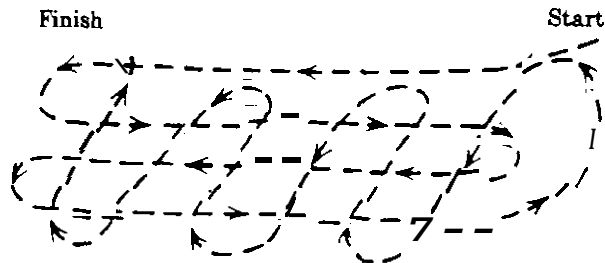
Sod shall be planted at all other times of the year or where an “instant” lawn is desired, such as on steep slopes or at high visibility locations. Sod **is** considerably more expensive than seed. Seed is, therefore, the preferred choice unless conditions preclude its use.

The turf bed is to be prepared and allowed to settle so that low areas can be filled. Never cultivate or rototill under the dripline of an existing tree, as this will destroy feeder roots and will damage or even kill the tree. The bed is to be cultivated to a depth of 3 or 4 inches. If necessary, fresh clean topsoil may be added and worked in at this time **as** well as lime and fertilizer. Apply lime and fertilizer **as** indicated by a soil analysis.



## LANDSCAPING INSTALLATION

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Method of applying seed and fertilizer

### Seeding

Seed is to be spread by a properly calibrated spreader set at half of the recommended rate for the type of seed used. Distribute half of the seed in regularly spaced passes with one inch overlaps in one direction. Spread the other half with the same spacing and overlap used earlier and in regularly spaced passes perpendicular to the first seeding. This process will ensure that no bare spots are left and it helps to unify coverage.

The seed bed shall then be very lightly raked or a small section of chain link can be dragged across the bed to lightly mix the seed into the soil surface. Lightly spread straw across the seeded area so that the soil surface is completely covered. A hydro-seeder may be used to distribute seed and mulch (wood fiber cellulose) at the same time, if one is available.

Seed can lie dormant in dry ground for weeks without harm. However, after the first wetting, the seed bed must be kept moist at all times. A minimum program would require watering or misting at least once a day; more watering may be necessary. As the new grass grows, lengthen the interval between watering and increase the amount of water.

The new grass shall not be mowed until it reaches a height of 3 to 4 inches and shall then be mowed to a height of 2- 1/2 to 3 inches. Not more than one third of the leaf blade is to be removed at any one mowing.

Overseeding is encouraged in areas where existing grass is thin or patchy. New improved varieties of the existing grass shall be used when available. Apply half of the normal amount of seed used for new seed beds. Use a colter-wheel type seed drill to apply the seed. Water as if it were a new seed bed and mow as the existing grass requires.

## LANDSCAPING INSTALLATION

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The following grass seed mixture is to be used for parade fields and housing areas: **25%** each of three certified varieties of bluegrass (Eclipse, Emmundi, Georgetown, Columbia, Glade, Merion, Midnight, Plush, Ram II, Sydsport, Touchdown or Vantage) **25%** Common Kentucky Bluegrass cultivar (Medit or South Dakota).

The following grass seed mixture is to be used at all other locations: 95% Tall Fescue (Jaguar, Clemfine, Mustange, Falcon, Rebel II, Houndog or Olympic) 25% Common Kentucky Bluegrass (Medit or South Dakota).

### Sodding

The preparation for laying sod is to include the same degree of soil cultivation and fertilization that is necessary in seeding. Lay sod strips so that ends are staggered **as** when laying brick. No joint shall be greater than 1/8 inch and all joints are to be filled with topsoil. After installation,

thoroughly soak and lightly roll the sod to eliminate air pockets. Soak the sod each day for a week. When the turf becomes established, normal watering (including rainfall) shall measure from 1 to 1- 1/2 inches per week.

### Groundcovers

Groundcovers can be defined **as** any shrub or vine that is low growing and spreading. The term “groundcover” is also used when larger shrubs are planted in mass to cover large areas of ground. Generally, though, the term refers to plants **18** inches or less in height and, depending on the species and growth habit, typically spread from **2** to 5 feet.

Groundcovers are generally available in pots ranging from 3 inches to one gallon. Smaller sizes spaced closer together are preferred since both the visual appearance and coverage is better than when large sizes are spaced farther apart. The minimum spacing of gallon sized plants is **12** inches on center, maximum spacing is 18 inches on center, 3 inch pots can be spaced 3 inches on center with a maximum of **12** inches on center. All groundcovers are to be spaced a minimum of **2** feet from any structure.

Groundcover beds are **to** be worked **at** least **6** inches deep. The plants are to be evenly spaced, set to finish grade requirements and immediately mulched with **2** to 3 inches of clean fresh mulch.



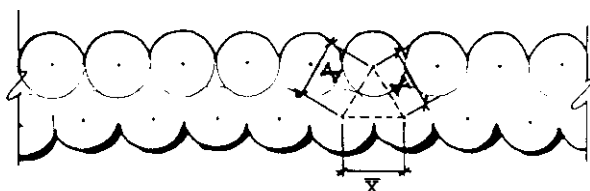


## LANDSCAPING INSTALLATION

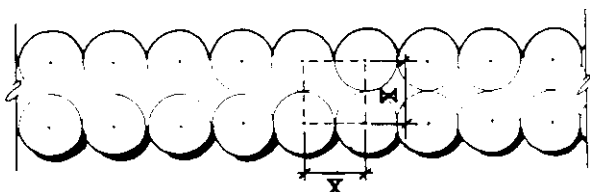
### Shrubs

Shrubs are most commonly purchased in containers or balled and burlapped. They are divided into three categories according to their mature height: Small Shrubs 3' to 5'; Medium Shrubs 5' to 8'; Large Shrubs 8' to 15'.

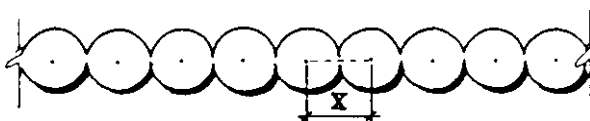
Small shrubs are to be spaced 2 to 3 feet from any structure. Medium shrubs are to be spaced 3 to 3- 1/2 feet apart and 3- 1/2 feet from any structure. Large shrubs are to be spaced 4 to 6 feet apart and at least 5 feet from any structure. These spacings are intended as guides only. In some instances plants may be placed closer together, such as where a dense screen is desired, or the spacing may be increased for a particularly wide spreading species.



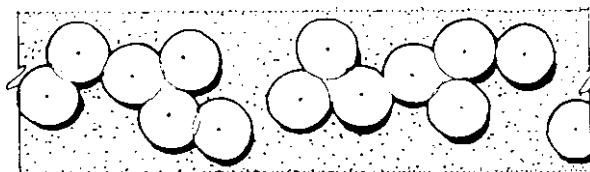
Hedge - Triangular Spacing



Hedge - Square Spacing (Not Recommended)

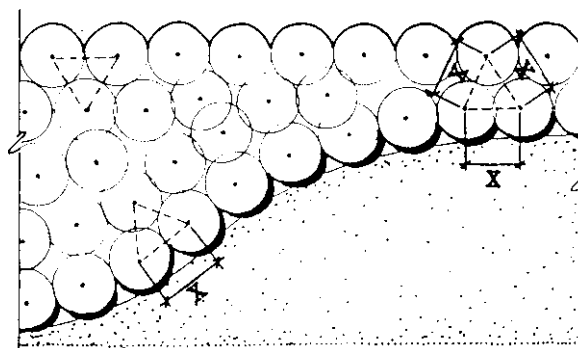


Hedge - Linear Spacing (Use only where there are Space Constraints)

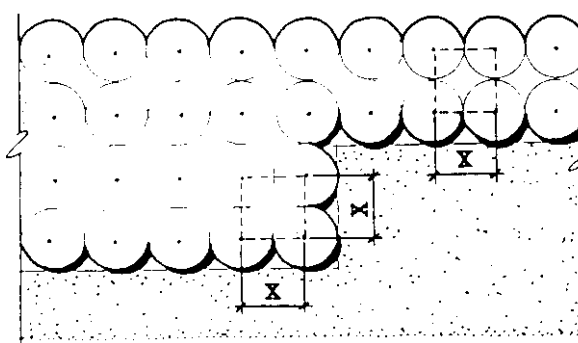


Shrubs - Irregular Spacing

The following sketches illustrate the different types of spacing. For plant beds of single species, the triangular spacing is preferred.



Shrub Bed - Triangular Spacing



Shrub Bed - Square (Not Recommended)

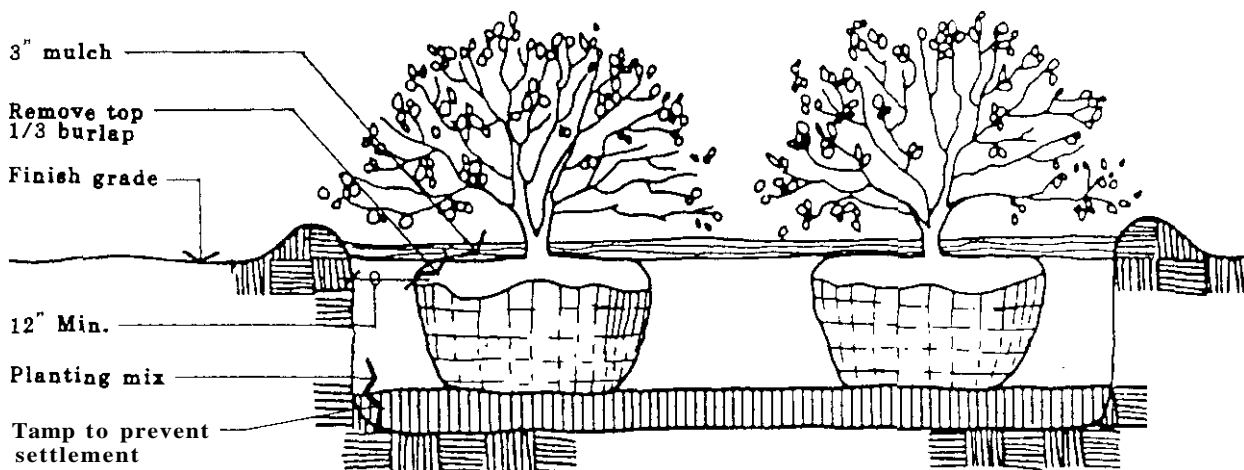
**X = Shrub Spacing, 2' - 6"**

## LANDSCAPING INSTALLATION

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Adherence to a prescribed set of plant installation and maintenance techniques is important to the survival of any shrub. The basic method for installation is outlined in the following steps:

1. Excavate the plant pit to a depth that is **6** inches deeper than the depth of the container or rootball and 12 inches wider than the width. Loosen the bottom of the pit **6** inches deeper or more so that when the pit is filled with water it will drain properly.
2. Mix the loosened soil with a planting **mix** that is 1/3 topsoil, 1/3 sand and 1/3 humus/peat until a **6** inch layer is formed. Tamp this layer to prevent settling.
3. Set plants in pit and add a layer of soil mix, tamp and water until soil mix is solidly around the rootball.
4. If shrubs were balled and burlapped, before final filling cut ropes, string or wire from the top of the rootball and lay open the burlap or wrapping and remove to the base of the plant. Plants should be 2 to 3 inches above finished grade after final filling.
5. Form a shallow saucer capable of holding water around each plant by placing a ring of mounded topsoil around the edge of each filled pit.
6. Immediately after planting, apply mulch in a 3 inch layer about and between all plants in the bed and thoroughly water.



Shrub planting detail

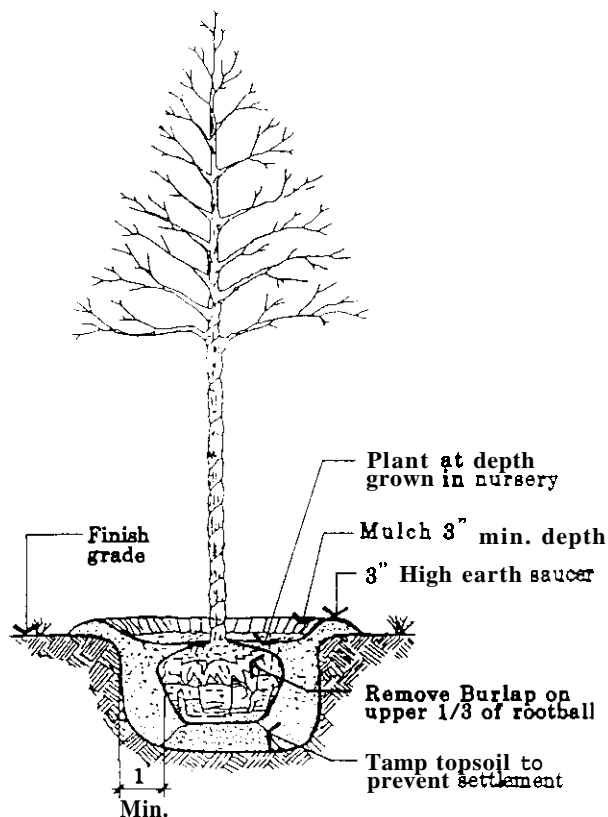


# LANDSCAPING INSTALLATION

## Trees

Suggested spacing for shade trees used along roadways is discussed in the “Street and Shade Trees” section of Landscaping . Spacing for evergreen and accent trees varies according to the species used and the design intent. Consult information about individual species in Section “Plant Materials” chapter.

Trees are available both in containers and balled and burlapped (B&B). Trees in containers can be put out anytime the soil can be worked (normally March through November). B&B trees are to be planted either between mid September and mid November or mid February to the end of April.



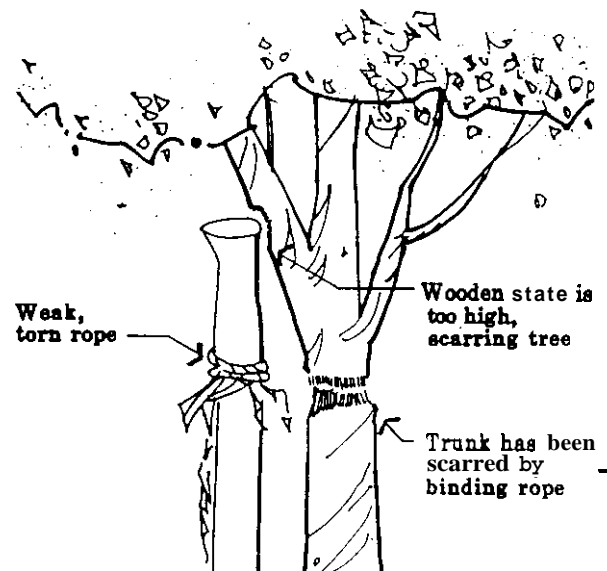
Tree planting detail

Planting techniques for trees follow the same process as the shrubs except the pit should be excavated to a width twice the diameter of balls 2 feet and less, 3 feet greater for balls from 2 to 4 feet in diameter and 1-1/2 times the ball diameter of balls over 4 feet. Subgrade at bottom of pit should be loosened to a depth of 1 foot. Backfill tree pit with prepared soil *mix* to a depth of 1 foot and compact. Set tree and backfill until approximately 2/3 of the pit is filled. Thoroughly water to remove any air pockets, and settle soil *mix* around rootball and form saucer as outlined in shrub planting outlines. Water thoroughly and mulch. Most newly planted trees require staking or guying.

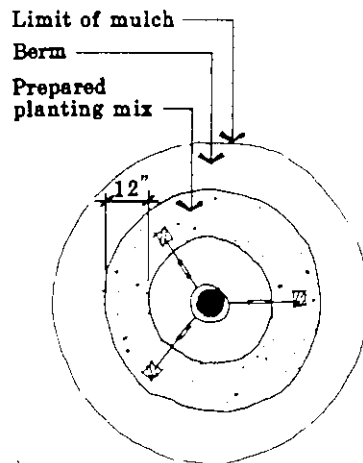
# LANDSCAPING INSTALLATION

## Staking and Guying New Trees

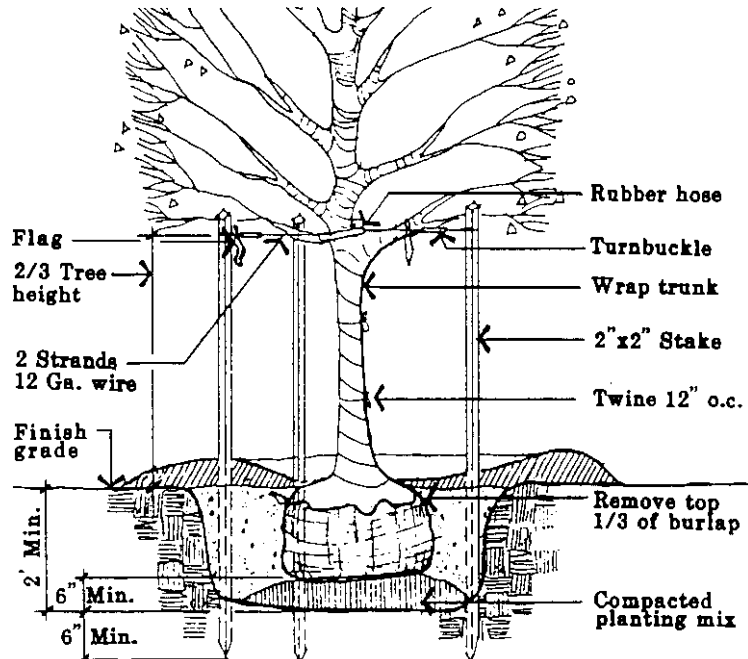
Trees shall be supported and protected immediately after planting with a tripod tree support constructed of wooden stakes. Trees under 3 inches in caliper are to be staked. Trees 3 inches and over in caliper are to be guyed. Small evergreen trees are to be staked as shown in the detail. Guys and stakes are to be removed after a full growing season (one year).



Incorrect staking technique



PLAN

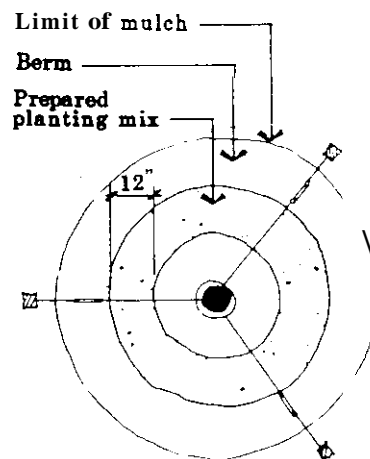


SECTION

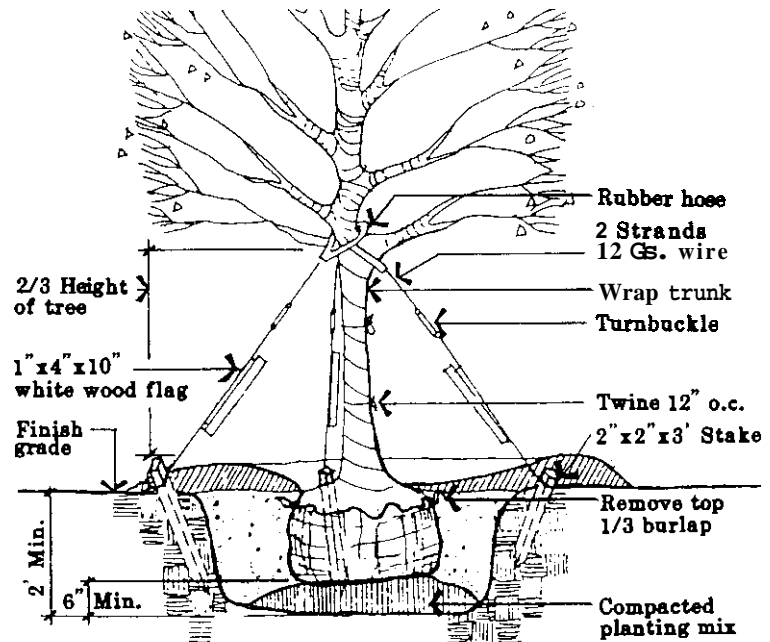
Tree staking detail (trees less than 3" in caliper)



# LANDSCAPING INSTALLATION

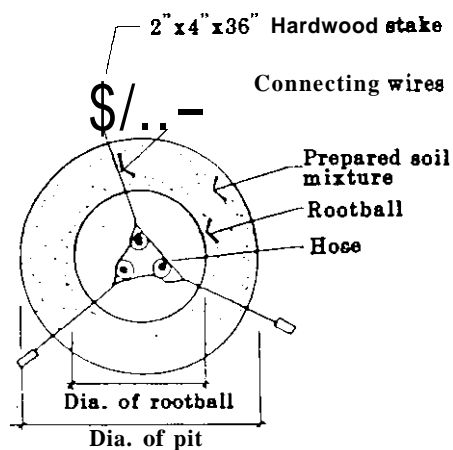


PLAN

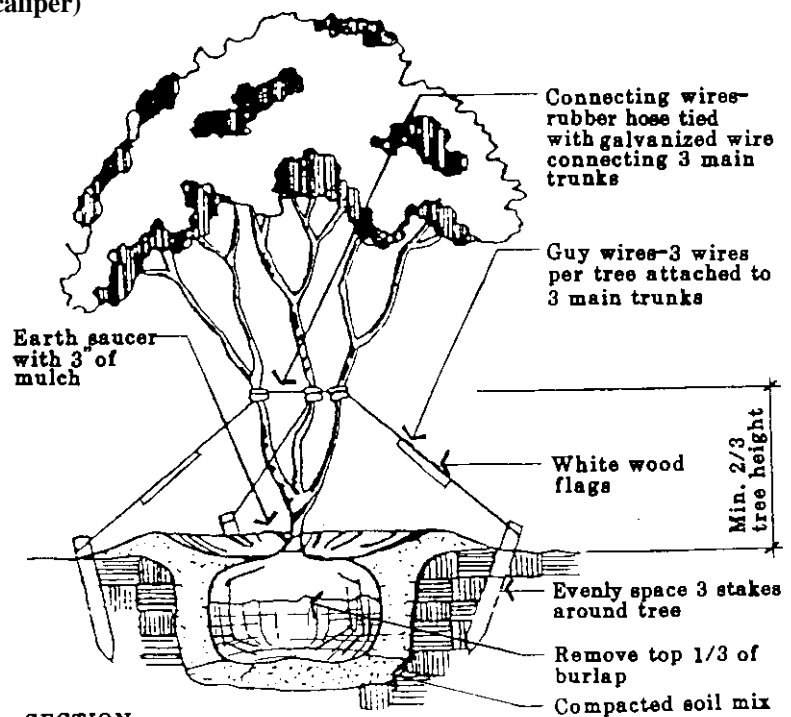


SECTION

Tree guying detail (trees 3" and over in caliper)



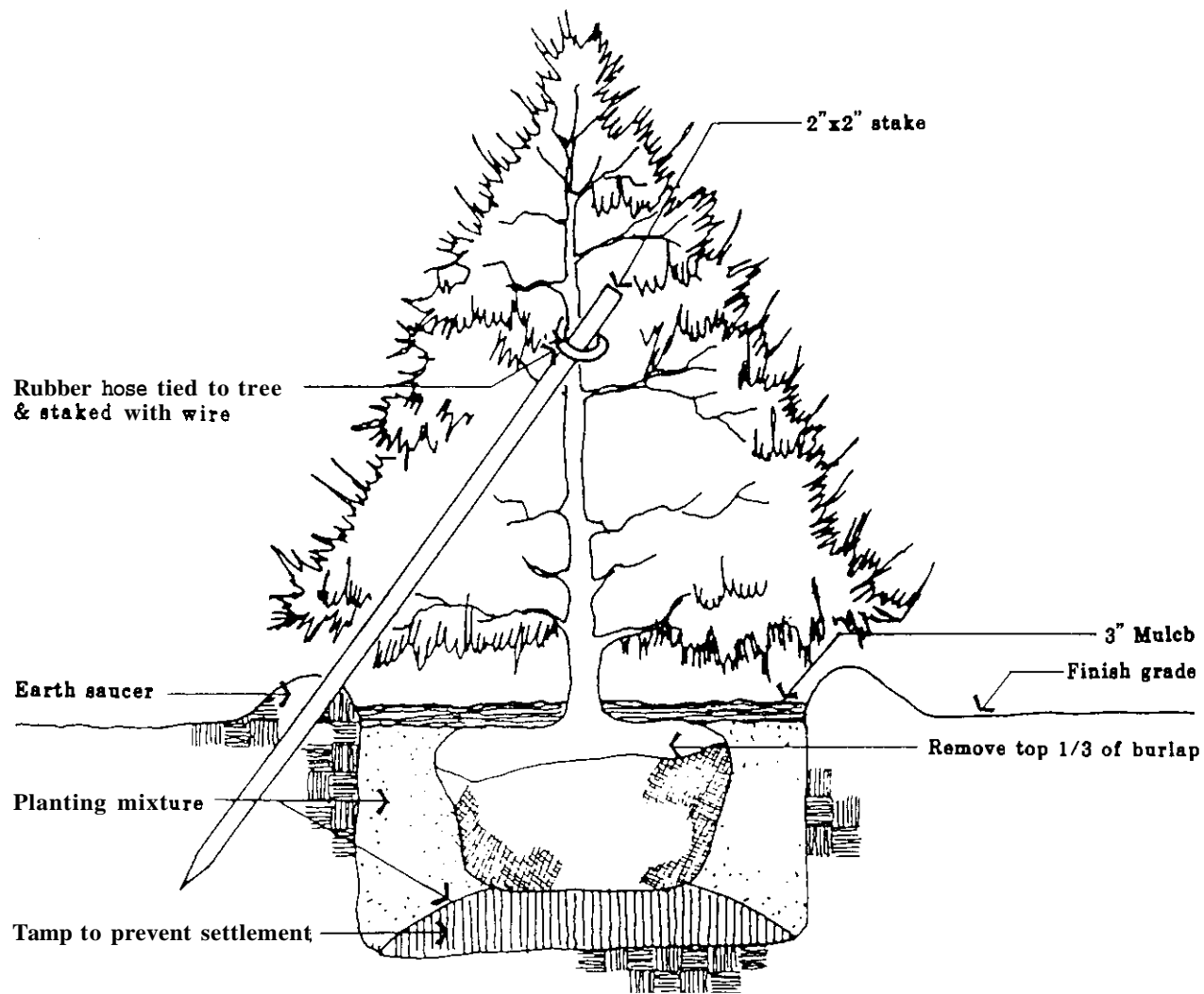
PLAN  
Multi-trunked tree guying detail



SECTION



LANDSCAPING  
INSTALLATION



Evergreen tree staking detail (4" height and less only)



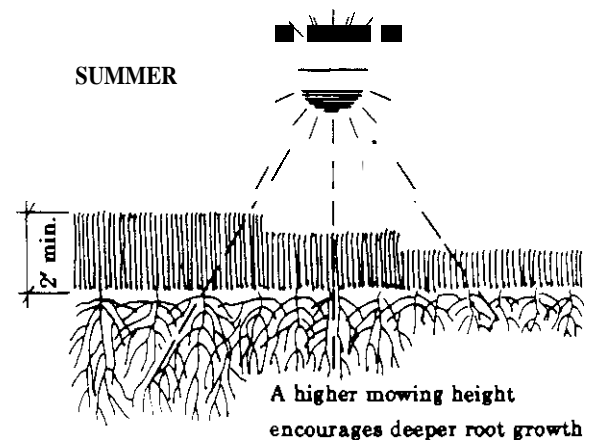
# LANDSCAPING MAINTENANCE

## Lawn Maintenance

Grass heights are to be maintained between 2 1/2 and 3 inches. Cutting the grass too short weakens it and reduces its ability to compete with weeds and to stand stress conditions such as traffic and drought. Turf will be mowed once a week or as deemed necessary by weather and season. No more than 1/3 height of turf is to be removed at one mowing. If the turf is too high to be mowed at 3" without removing too much of the leaf blade, then the mowing height must be raised for that particular mowing. This problem is most likely to occur during peak growing seasons and it indicates that the turf is not mowed often enough.

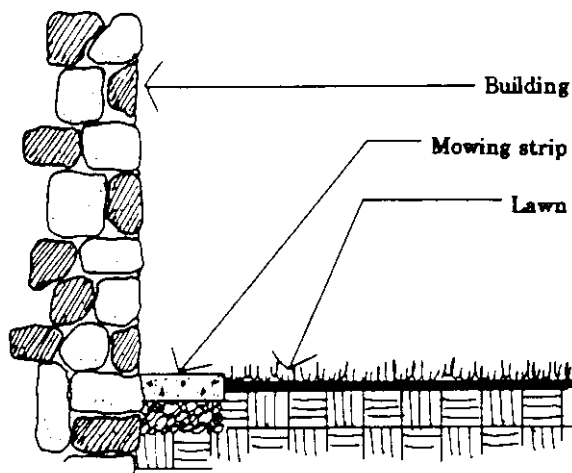
Grass blades that are cut at the correct height shade grass roots from the midsummer heat, thereby encouraging deeper, healthier roots.

Grass clippings are to be left on the lawn area and not collected, if possible, to add nutrients back into the soil. Clippings must be collected if there are so many that they shade out the grass, if left on the lawn.

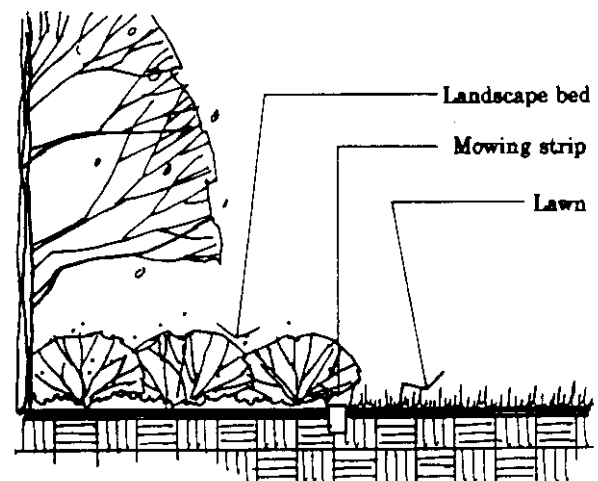


Mowing height

To reduce maintenance requirements, edging or precast **units** shall be used as mowing strips along building edges and landscape beds.



Mowing height

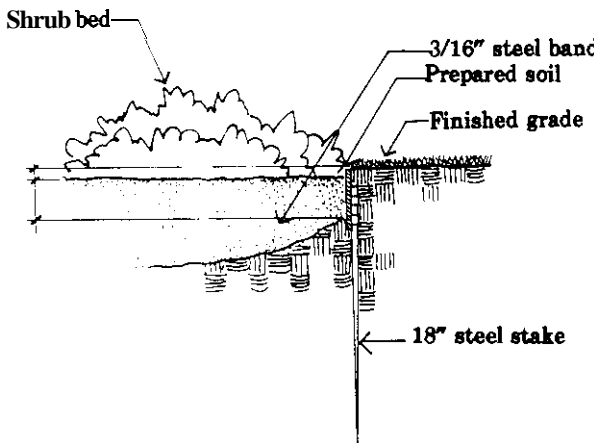


Mowing strip by landscape bed



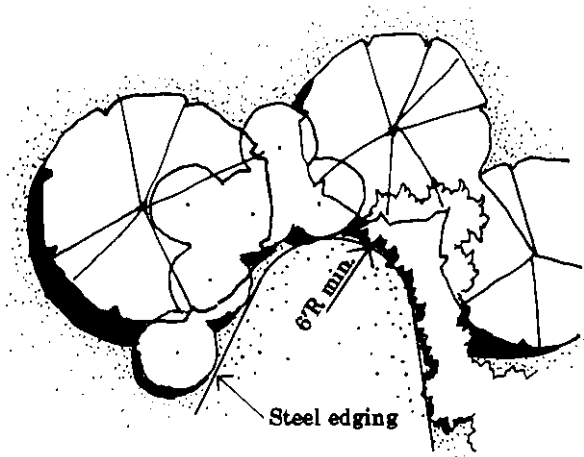
LANDSCAPING

MAINTENANCE



**Edging**

Steel edging will be used throughout the Post.



Bed layout is to be done in such a manner so that maintenance vehicles can easily negotiate the corners or curves.





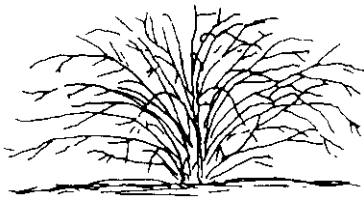
## LANDSCAPING MAINTENANCE

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### Shrub Maintenance

If shrubs are maintained in an actively growing, healthy state, insects and disease will be kept to a minimum. Fertilizing and pruning are the most frequently required maintenance items for suitably located and healthy shrubs.

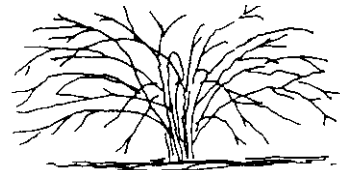
- Trimming shall follow the natural line and form of the plant. Shrubs shall not be trimmed to severely structured shapes. To reduce maintenance, plants shall be installed close enough to form a mass and shall be trimmed as a group rather than individual plants.
- Deciduous plants are pruned anytime during the dormant period except plants that bloom in early spring. Those plants are pruned after flowering because buds are set on the previous year's growth. It is best to prune evergreens just before spring growth starts. Azaleas and rhododendrons are best if pruned immediately after flowering.
- A nitrogen based fertilizer (4-1-2) is to be applied in the spring for top growth and a phosphorous based fertilizer (3-4-1) is to be applied in the fall for root growth. Use 2/1 cup per foot in height of shrub and work into the soil by hand. Apply most of the fertilizer away from the trunk and near the dripline where most of the feeder roots are located.
- When shrubs and multi-stem trees need thinning, surplus stems shall be removed from the base instead of trimming the entire plant at an arbitrary height. See illustrations below.



Existing shrub with an accumulation of crowded stems



Improper pruning destroys the natural shape of the plant



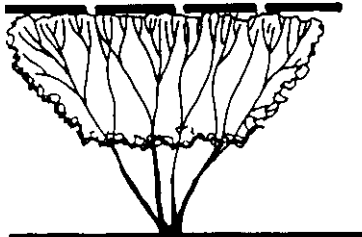
Proper pruning removes surplus stems at base



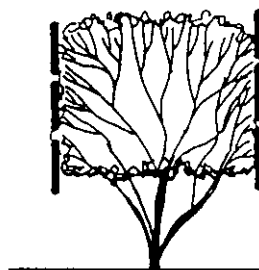
## LANDSCAPING MAINTENANCE

### Shrub Pruning

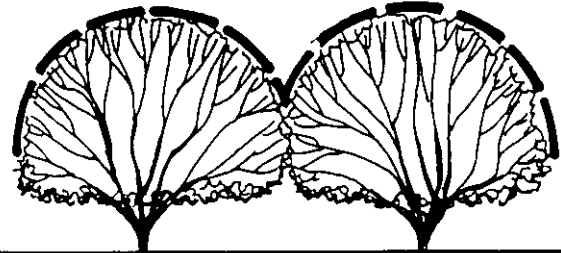
Do not prune shrubs flat across the top, straight down the sides or into individual globes.



**Flat top**  
**Improper pruning practices**

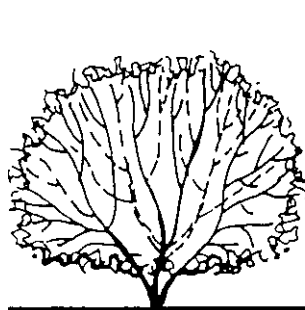


**Straight sides**

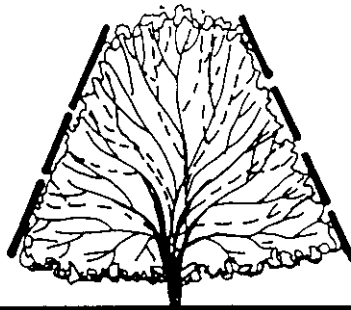


**Individual globe shape**

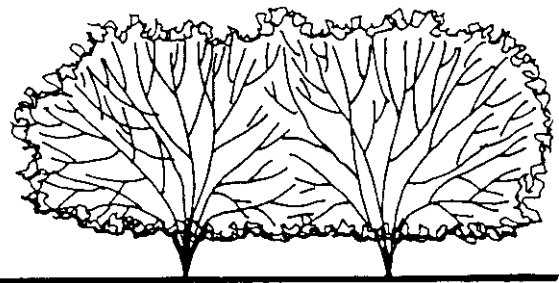
The natural shape of the plant is to be preserved. Reduce height and width by pruning the longest branches back to the base of the plant. This practice encourages new growth from the center of the shrub, making it fuller. Hedges are to be pruned wider at the bottom than at the top to allow sunlight to reach lower branches, preventing bottom die out and legginess.



**Prune individual branches to base**  
**Correct pruning practices**



**Wider at bottom**



**Shrub massed together as one shape**



### Tree or Large Shrub Maintenance

Trees or large shrubs shall be pruned at planting, and thereafter periodically trimmed to improve their shape.

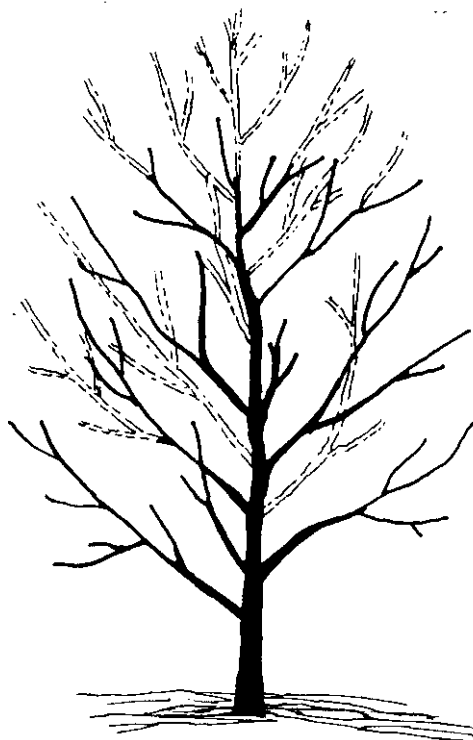
1. Pruning at planting.
2. Intermediate pruning.
3. Limb structure established; evenly spaced around trunk

NOTE: The leader was never cut.

Pruning diagrams

## LANDSCAPING MAINTENANCE

It is possible to reduce the height and spread of a tree and still maintain its natural shape.

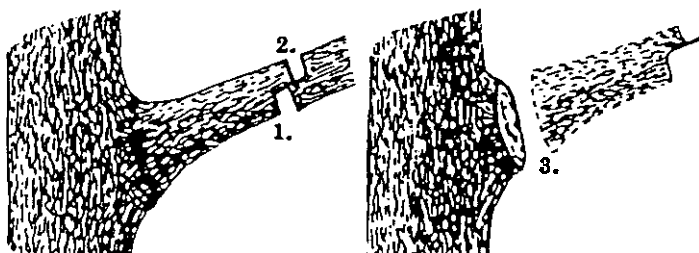


Reduction of the height and spread of a tree

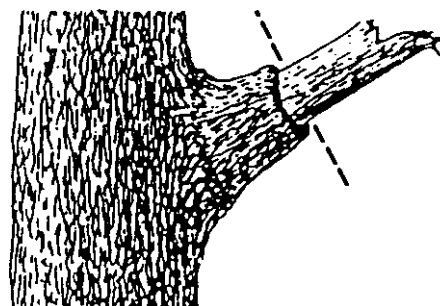
Remove a large limb by making three cuts:

1. Make the first cut on the bottom of the branch **12-24"** from the branch attachment.
2. Make the second cut on the top of the branch within 1" of the undercut.
3. Make the final cut just beyond the out portion of the branch collar. The first two cuts were necessary to remove weight of the branch **and** allow cut #3 to be clean without ripping.

A dead branch stub that has a collar of live wood would be cut just at the outer edge of the collar and treated to prevent decay and insects from entering interior wood.



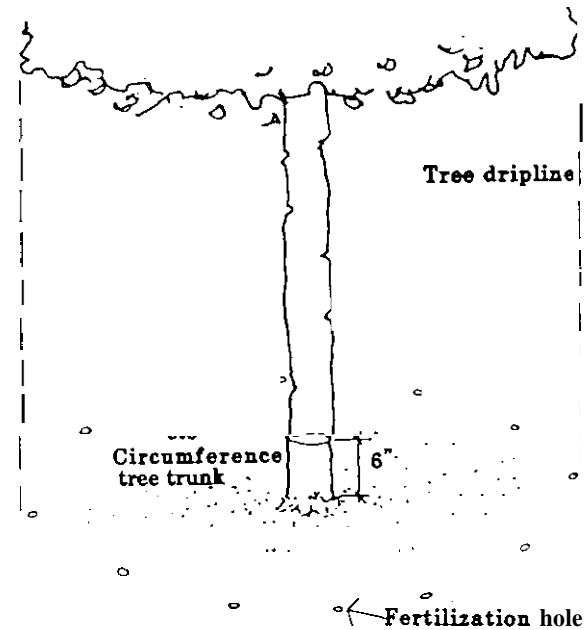
Limb pruning



Dead Wood Removal



## LANDSCAPING MAINTENANCE



Tree fertilization diagram

All street, shade and specimen trees shall be deep-root fertilized every 3 to 4 years with a **4-2-1** proportion of elements with a slow release fertilizer during the dormant period of the tree (November through February). In order for a tree that has grass or shrubs growing under it to receive the maximum benefit from the applied fertilizer, it is necessary for the fertilizer to be placed below the grass roots and deep into the soil. This is to be accomplished by boring 8 (or 10) 1 1/2" diameter holes at the tree dripline to a depth of **18"-24"** for mature trees and **12"-18"** depth for new plantings. Add appropriate fertilizer to each of the holes so the total amount of fertilizer per tree is equivalent to one cup per 3" of tree trunk circumference. Be sure to cover the holes with 4" of soil upon completion and water thoroughly. A 9.5" circumference tree trunk should receive 3 cups of fertilizer distributed at a rate of **1/4** cup per hole.



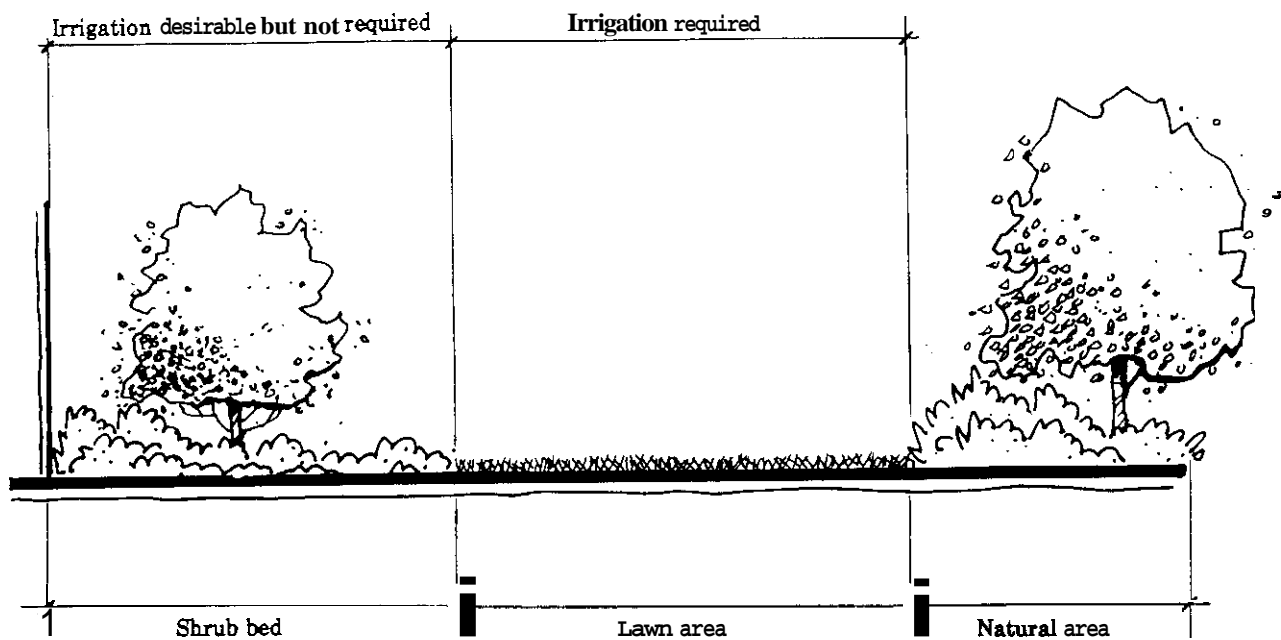
# LANDSCAPING

## IRRIGATION

### Irrigation

Areas requiring irrigation include administration buildings, community facilities, shoulders and medians of major roadways and entrances, and other highly visible and important areas.

Irrigation in these places should be limited to lawn areas and important plantings such as foundation plantings, accent flower beds, and specimen plants. Lawn or turf in these areas must be irrigated.



All sprinkler heads used in lawn or turf areas should be of 3 inch pop-up type.

Low shrubs, flower, or annual beds, and groundcovers are areas where a 6 inch or 12 inch pop-up head should be used. The height of the pop-up head is determined by the maximum height of the plant material being irrigated.

Spray heads should be mounted on shrub risers of heights from 12 inches and up in areas where shrubbery is too tall for pop-up heads.

Shrubbery too tall for shrub risers should be irrigated with pop-up heads, as long as the lower branches are high enough to allow clearance for the spray.

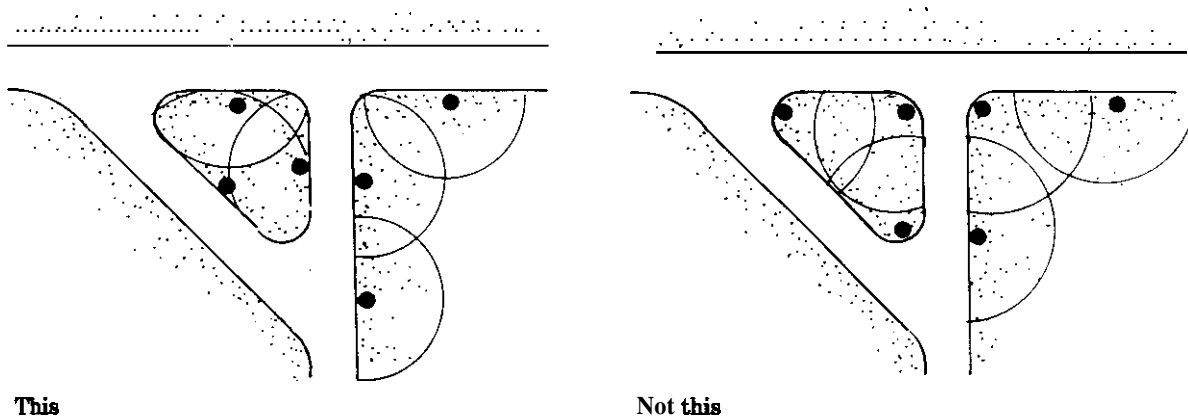


## LANDSCAPING IRRIGATION

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Careful placement of sprinkler heads will minimize over-spraying and accidental damage to the heads.

Sprinkler heads should be placed a minimum of **12** inches from curbs to prevent tire damage to the head. Sprinkler heads can be placed next to walks as long as they are not located where a short cut may occur.



Quarter arc, adjustable arc, strip sprays, and other special spray pattern nozzles should be used in small or oddly shaped planting areas to prevent spraying on pavement or adjacent structures. **In** addition, the radius on most heads can be field adjusted to prevent wasteful over-spraying on pavement.

Caution should be exercised when installing irrigation systems near existing plant material. Pipe lines should be routed around root zones of existing plants. Trenches within the dripline of existing trees should be hand dug to prevent unnecessary damage to the tree.

## LANDSCAPING PROTECTION & CLEARING

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### General Information

New development on Post will make a conscious effort to preserve existing vegetation and protect it from damage during construction.

Before construction begins, spray trees to be protected with insecticide to help prevent borers. Repeat in **4** weeks. Also, spray any trees suffering bark breakage during construction.

Fertilizing key trees prior to construction can help ensure survival. Consult a professional for rates and methods of application.

Use roads/drives for all construction access and building material storage. Do not allow cement or other wastes to be deposited outside the roads/drives, or let contractors bum wastes under the trees, or park vehicles anywhere except roads/drives.

Use as small a piece of equipment as possible for all site work outside roads/drives with minimum travel around trees to avoid soil compaction and root damage.

Do not leave tops or downed trees on the site. When making removals, haul off the entire tree debris as soon as possible.

If a tree is to be left in a small space, be sure it can survive. If the tree will not survive, remove it and plant a suitable species or consider other landscaping for the site.

Finish all work that impacts the trees at one time.

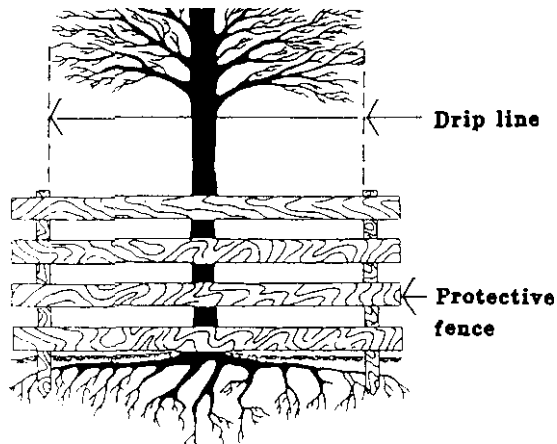


## LANDSCAPING PROTECTION & CLEARING

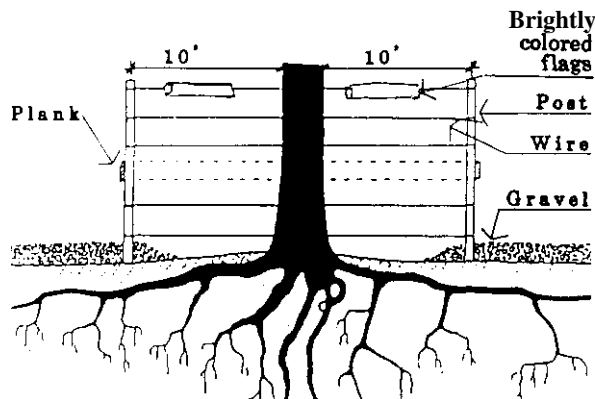
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### Purpose

The existing vegetation on Post is an invaluable asset that is not readily replaced, especially the many mature trees. The following preservation practices for existing trees will help maintain the positive effect that these trees have on the Post's visual image.



Protective wooden fence



Wire protection fence

### General Protection of Roots and Trunk During Construction

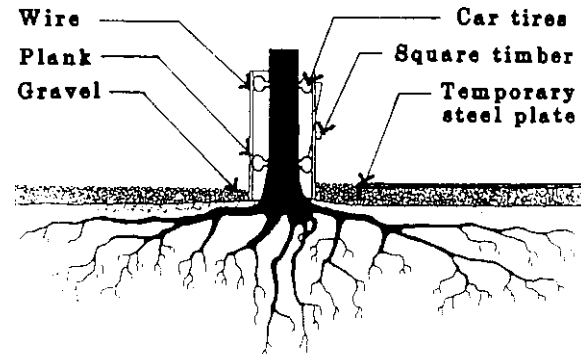
There are three different methods of protecting the tree during construction, depending upon the conditions. The most comprehensive protection is achieved if the tree is encircled by a wooden protective fence at the dripline (outside edge of the branches) of the tree. This protects the roots, branches and truck. This protection method should be used for fragile or specimen trees where the entire root system must be protected.

Another method of protecting smaller trees or trees in confined space is the installation of wire fence located 10' from the tree trunk. This is also the method that should be used if the tree is very hardy and it is not vital to protect the entire root system.



## LANDSCAPING PROTECTION & CLEARING

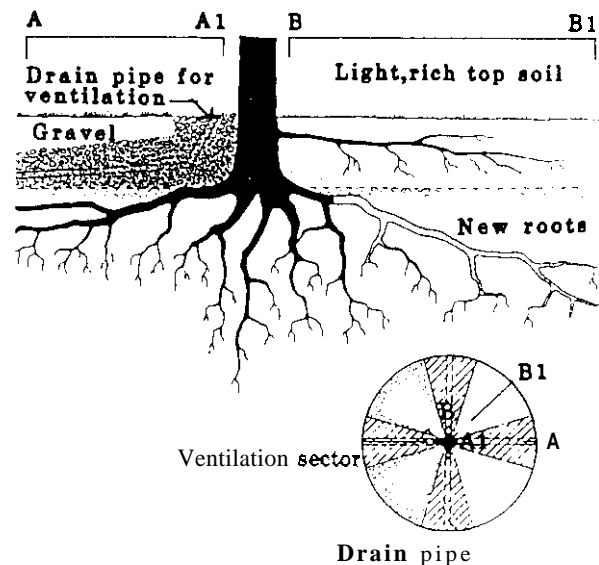
In very confined areas where construction vehicles must be operated close to trees, a protection device is wrapped around the tree. Car tires separate wooden planks form the trunk creating a bumper if a vehicle hits the tree. The root system is protected by temporary steel plates. These plates spread the compaction forces of a construction vehicle over a larger area reducing spots of heavy compaction on the roots.



Protection surrounding the trunk

### Protection Against Overfill

Overfill is additional dirt or gravel placed around the tree to alter the existing grade. Overfilling often kills trees because it reduces the amount of air and water a tree receives; i.e., the roots are located below more soil so less water is absorbed before the water runs off and less air reaches the roots. If overfill is necessary, the following precautions must be taken; one third to one half of the root area are to be covered with porous material, the other areas are covered with rich top soil. Drain pipes for ventilation are also installed. This section illustrates how overfill is to be executed.



Protection from overfill

### Protection of Root Areas During Short Term Digging

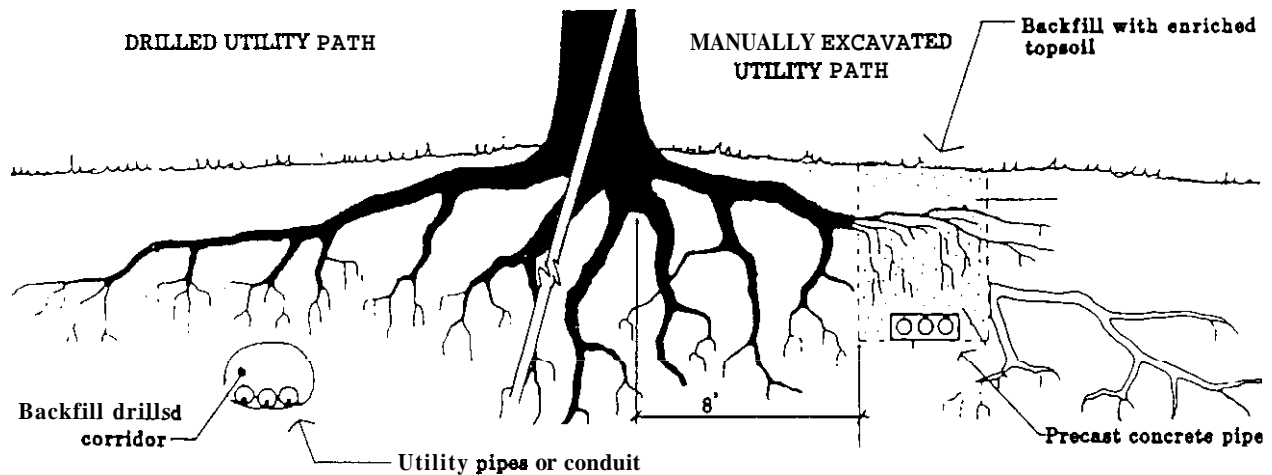
Digging in root areas should generally be done only by hand and no closer than 8' from the trunk. In special cases, this distance may be reduced to 5' for deep rooted trees or 6.5' for shallow rooted trees. The roots are to be cut cleanly by a sharp knife. Any cut root shall be sealed. Roots shall be protected against drying out and frost damage while uncovered.



## LANDSCAPING PROTECTION & CLEARING

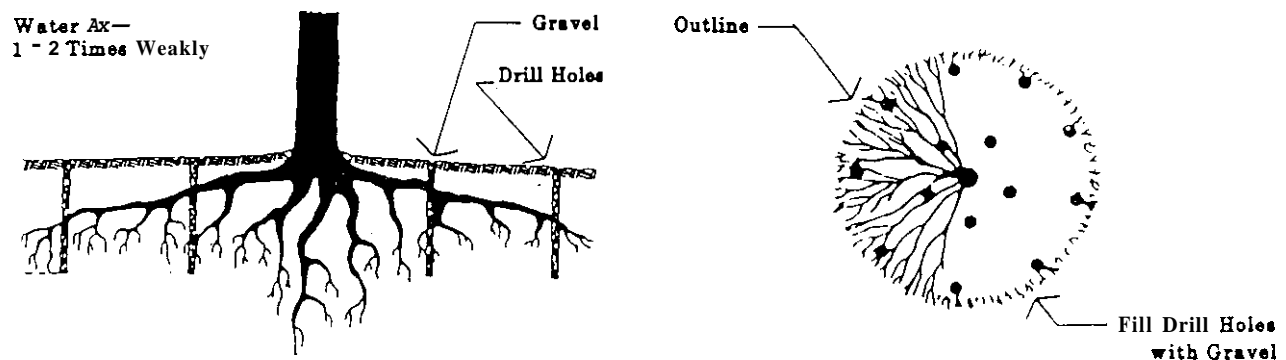
### Protection of Root Areas During Installation of Utility Lines

During installations of utility lines, root areas shall be penetrated only by drilling through the root areas or by manual excavation of the trench. Both techniques are illustrated below. To avoid root dehydration, pipes shall be laid and the area backfilled immediately.

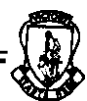


Drilled and manually excavated utility installation

### Protection During Drought



Dehydration protection



## LANDSCAPING PROTECTION & CLEARING

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During construction there may be related water table reductions which occur during the growing period. If the construction period lasts longer than 3 weeks and there is not sufficient rainfall, the trees shall be watered weekly.

### Debris Removal

Beside thinning and pruning, clean-up **work** shall consist of the removal of hazardous growth, dead, dying or diseased plant material, and all flammable material on the ground within 50 feet of the cleared edge of the woodlands.

Dying trees should include all trees which will not survive if left in their present condition and which cannot be saved by normal maintenance, pruning and care. Any tree with a **25** percent dead crown, unless otherwise marked for saving, should be considered a dying tree and removed.

All trees to be removed should be cut as close **as** possible to the ground (no higher than 3 inches) and felled so as to avoid damaging adjacent material. In order to control regrowth of undesirable material, remaining stumps 3 inches or more in diameter should be painted or sprayed within *two* weeks after cutting with a mixture of 1 part herbicide (such as 2, 4-D or 2, 4, 5-T) and 19 parts fuel oil. Do not use kerosene because of its toxicity to desirable plants and its flammability. Care shall be taken to not spray or paint vegetation to remain.

All undesirable undergrowth should be removed and trees should be cleared of vines.

Remove all previously fallen trees and branches. Clear and grub all uprooted and dead tree stumps.

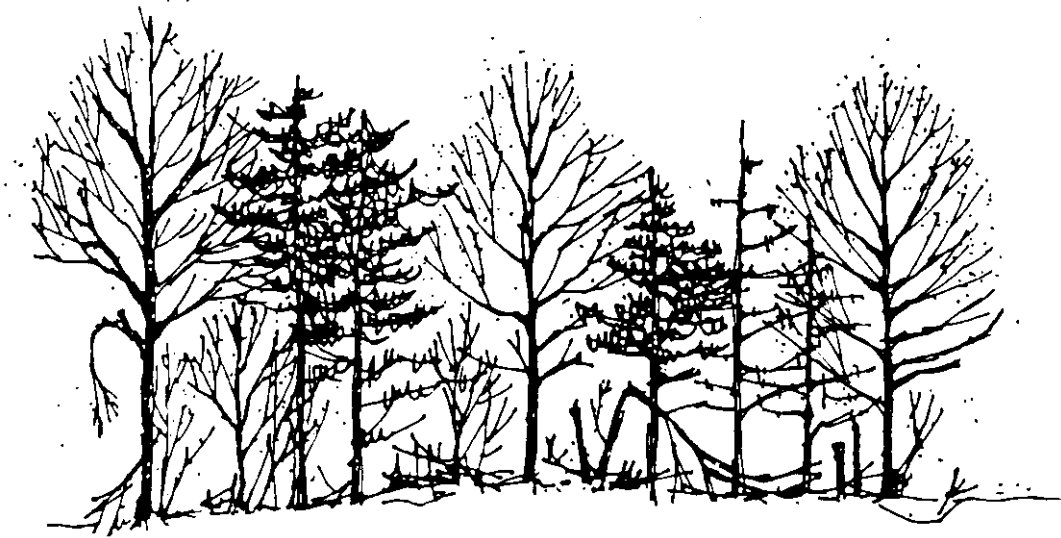
Any stumps and roots in high visibility areas, or in the Administrative, Community Facilities, Housing or built up Mission Support Zones will be removed to a depth of **8** inches below surrounding grade.



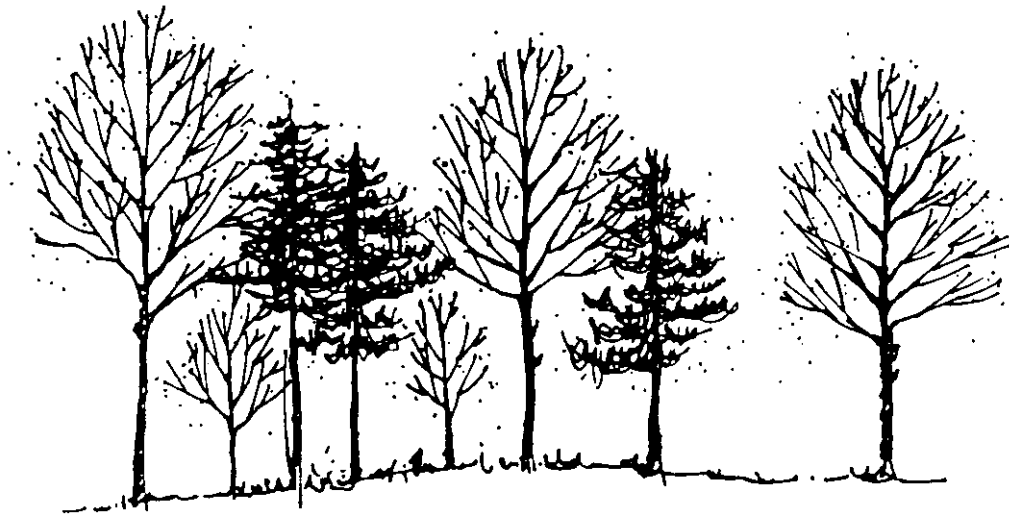
## LANDSCAPING PROTECTION & CLEARING

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### Debris Removal



Before clean up - woodlands are littered with fallen trees and branches, undesirable undergrowth and general debris.



After clean up • only desirable vegetation remains.



## LANDSCAPING PROTECTION & CLEARING

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### Thinning

Wooded areas shall be thinned out to provide space for healthy growth by the elimination of thinner, weaker trees and the reduction of the number of varieties. Thinning of woodlands involves the removal of tree branches and of groups and individual trees which interfere with the growth of more desirable types of trees; the clearing away of lesser growth that may obscure outstanding trees, tree groups, or scenic views; and clearing for paths.

Thinning should be done on the basis of space available for crown development. Thinning allows sunlight to penetrate between the tops of the trees that remain in the stand. Examine the stand tree by tree and mark those trees to be removed.

Crown thinning is recommended for 50' inside the woodlands that line major entry roads and those roads in recreation areas of open space. Thin the stand from the top down, removing poorer branches to favor other limbs that are more vigorous and of better form.

Prune trees three inches in caliper and up. Pruning and thinning work shall apply to the full height of affected trees. Prune all dead, diseased or dying branches and all interfering or structurally weak branches that impede vigor of plant. This will include the satisfactory removal and disposal of all debris material generated.

Understory trees which line the edges of forests are to be preserved and encouraged. Often the promotion or 'sealing' of these edge conditions can preclude the thinning of the adjacent woods.



**LANDSCAPING  
PROTECTION & CLEARING**

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**Thinning**



**Before thinning**



**After thinning**

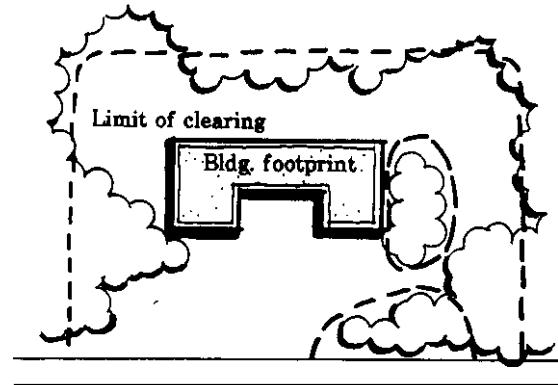


## LANDSCAPING PROTECTION & CLEARING

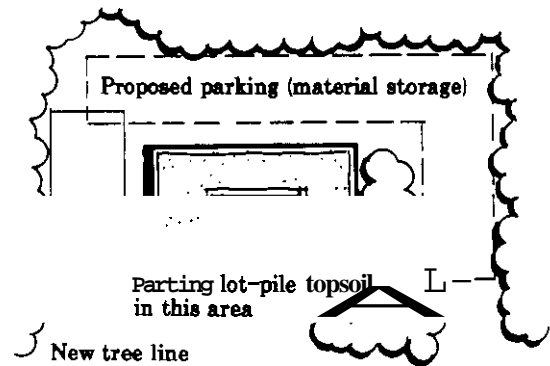
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### Clearing

Buildings should be sited to preserve as much existing vegetation as possible. A limit of clearing line should be established to protect against unnecessary eradication of woodlands.



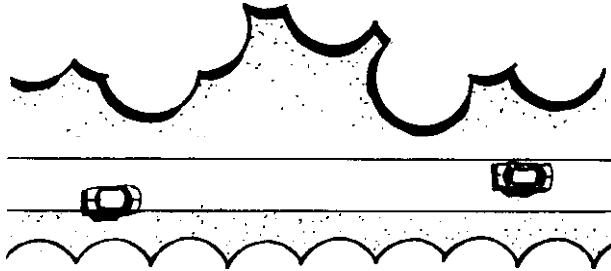
Existing trees enhance architecture and provide shade.



## LANDSCAPING PROTECTION & CLEARING

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Acceptable road treatment



Unacceptable road treatment

### Clearing

When clearing for roads, a straight edged tree line is undesirable. A varied edge is much more desirable —giving added interest to the road, preventing monotony. Use understory species to "seal" this new edge into a natural condition.





## LANDSCAPING

### EROSION CONTROL

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#### Erosion Control

Erosion control for existing slopes can be achieved by regrading, building walls, or planting the slope.

- Any slope greater than 1:1 shall be regraded and stabilized with a retaining wall.
- Groundcover can be used to stabilize a slope as steep as 1:1 if it is a fill slope.
- Shrubs can be used to stabilize a slope with a 2:1 slope. If the shrub growth rate is slow, plants should be spaced close together.
- Erosion control matting should be used in conjunction with plantings to maintain the slope until the plant roots are established.
- Grass slopes to be mowed are to have a maximum slope of 3:1.
- In areas where erosion is caused by pedestrian traffic, paved paths and/or pedestrian control devices shall be provided.

#### Erosion Control During Construction

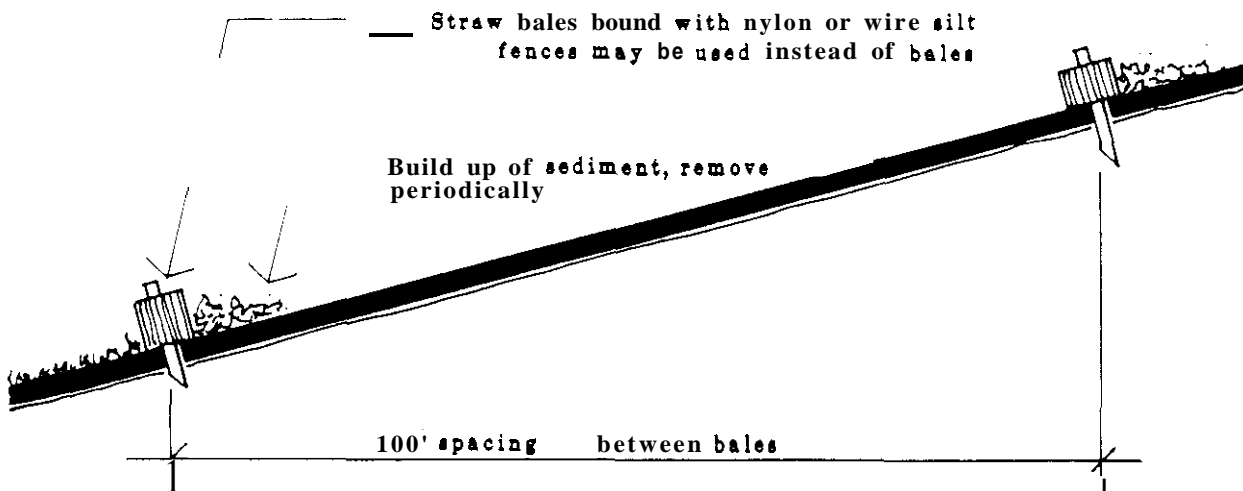
The following techniques to reduce the generation of sediment will be applied to all sites undergoing construction.

- Careful programming of a development may enable the developer to reduce the area stripped of vegetation at any one time. Phasing of a large job is one example. However, high mobilization costs of heavy earth-moving machinery may dictate that all earth moving be done at one time. In that case, all areas of the site which will not be used for construction within 4 months are to be seeded.
- Topsoil from all areas undergoing construction are to be stripped to a depth of 9 inches and stockpiled. The location of these stockpiles are to be carefully selected so as not to obstruct site operations, therefore resulting in double handling. Topsoil mounds should not be more than 8 feet in height with side slopes of 1:1.5 to 1:2. If they are to be stockpiled for more than 4 months, they are to be seeded with a temporary seed *mix*. A shallow trench around these mounds made with a bulldozer blade will prevent soil erosion from the mounds from washing into adjacent property or into drainage channels. A silt fence may also be used in lieu of a trench. The topsoil is to be re-spread on the site during the fine grading phase and supplemented with imported topsoil if necessary.



## LANDSCAPING EROSION CONTROL

- Straw bales may be used to filter sediment from runoff generated by large stripped areas. Where the length of slope exceeds 100feet, the accumulation runoff may cause serious erosion. Therefore, the downslope of all stripped areas exceeding 100feet shall be lined with straw bales with wooden stakes. Where they do not obstruct construction activities, lines of bales may be staked at regular 100foot intervals along the contour on very long slopes. Regular inspection and removal of sediment is necessary, particularly where only one line of bales is used on long slopes.



**Construction slope stabilized with straw bales**

- Grass-lined channels are cheaper and are usually much more acceptable than those lined with concrete. Grass will delay run-off and considerably reduce the energy and consequently the erosive capacity of run-off. The vegetated waterway maximizes the loss of surface runoff through infiltration.
- Parabolic cross-sections are most commonly found in nature. Side slopes should not exceed 3:1 to enable the channel to be mowed. These waterways should be located at areas of suitable grade where soil moisture conditions are favorable to vegetative growth. Natural swales should be favored, if possible.
- It is important to avoid excessive compaction during construction by earth-moving machinery which will result in an inferior grass sward. Between the time of seeding the cover and the actual establishment, the waterway will be unprotected and subject to damage. Provisions should be made to divert flows during this period. Vegetated waterways should not be subject to continuous flows of water nor be kept wet, since this will destroy good turf. A tile drain can help to offset this problem. Tiles should be laid parallel to the center line of the waterway but offset from the center by at least  $\frac{1}{4}$  its top width. This will prevent washout of the backfill material for the tile system. Use a 4" perforated PVC wrapped in a sediment blocking geotextile fabric.



## LANDSCAPING

### EROSION CONTROL

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#### Hydroseeding

Hydroseeding is an effective way of establishing grass or wildflowers. The following general guidelines apply to hydroseeding in high visibility areas.

All cut slopes shall be scarified or horizontally ripped to a depth of ~~six~~ inches across the slope and spaced not more than twelve inches apart on the slope, thus allowing pockets or cavities for the absorption of seeds, fertilizer and fiber mulch products between the cracks and crevices. This scarification process will facilitate a high water-holding capacity which in turn allows the hydroseeded seedling root systems to absorb more moisture which is trapped beneath the rocks and pebble particles. Hence, the seedlings will be allowed to grow and become established more rapidly. Furthermore, the scarification of cut slopes reduces seed and fiber erosion during intense rains and/or prolonged irrigation.

All fill slopes shall be sheepsfoot rolled. The 2" x 2" x 4" rolled depressions shall be left undisturbed and no cultipacking shall be performed. Once the sheepsfoot depressions are made, the hydroseeder will take care and ensure that he sprays the fiber mulch into all rolled depressions. The depressions act ~~as~~ pocket reservoirs for seeds, fertilizer and water as well as shade and wind protection for the young germinating seedlings. The depressions also act as surface erosion control pockets trapping eroding overburden soils during heavy rains.

Flat areas along roadsides and easements where hydroseeding is to be utilized should be diced to a depth of ~~six~~ inches, thus removing all weeds and allowing the areas to be left in a non-compacted roughened condition to facilitate the retention of hydromulching fertilizer and seed when the hydroseeding application ~~is~~ sprayed.

All existing vegetation is to be manually and mechanically removed.

Fertilize all planting areas with 16-20-0 commercial fertilizer (or by soil analysis recommendations) at the rate of one-half pound per 1,000 square feet. Add any and all top soil amendments as required per soil analysis. Begin watering process to activate fertilizer and chemicals. Water all planting areas thoroughly and continuously for a period of two consecutive weeks. This allows all residual weed seeds to germinate.



## LANDSCAPING

### EROSION CONTROL

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Discontinue watering process for two days. Then apply a nonselective systemic herbicide if perennial weeds appear on the slopes. The type of chemical to be used will be determined by a Licensed Pest Control Advisor. If annual weeds appear, use straight contact herbicide as per Pest Control Advisor's recommendations. No water shall be applied for a minimum of four days following application of contact weed killer. Allow sufficient period of time to ensure that all weeds are dead.

Water all planting areas thoroughly and continuously for a period of three weeks. A shorter watering period may be permissible at the discretion of the landscape architect and/or his pest control advisor. Discontinue watering process for one day prior to the second application of the herbicide spraying. Reapply the spraying operation with a straight contact weed killer as per Pest Control Advisor's recommendations. Allow a minimum of four days without irrigation for effective final weed kill.

Clear all desiccated weeds from the slope to the finished grade and water all planting areas thoroughly and continuously for three consecutive days to saturate upper layers of soil prior to the hydroseeding operation.

Allow planting soil surface to dry out for one day only prior to the hydroseeding application. Care must be taken not to allow the soil surface to be over saturated with water prior to the hydroseeding installation. At the same time, the soil surface should not become completely dry. There should be some residual moisture within the first 1/4 inch of the soil surface.

The hydromulching shall be applied in the form of a slurry consisting of organic soil amendments, commercial fertilizer and any chemicals specified. When hydraulically sprayed onto the soil, the mulch shall form a blotter-like material. The spray operation must be so directed that the slurry spray will also penetrate the soil surface and *mix* the slurry components into the soil, thus ensuring maximum impregnation and coverage. The impregnation and mixing of the components will help in retaining moisture while stabilizing soil surface from erosion.

The slurry shall be prepared at the site and its components shall be mixed to supply the rate of application as per specifications.

## LANDSCAPING

### EROSION CONTROL

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The operator shall spray the areas with a uniform visible coat using the dark color or dye of the cellulose fiber or organic amendment **as** a visual guide. The slurry shall be applied in a downward drilling motion via a fan stream nozzle. It is important to ensure that all of the components enter and **mix** with the soil. The contractor shall employ only qualified personnel to ensure uniformity of the hydromulch application.

Approximately 25 hours after hydromulching the planting areas, the watering sequence should be initiated. The water should be applied by water truck or a temporary irrigation system and regulated to moisten the soil thoroughly to the depth of the slurry mulch taking care not to over saturate or wash away the slurry and seeds. Frequent, light waterings must be performed to establish seedling growth. Furthermore, the slurry mulch and seed must be irrigated frequently to maintain optimum moisture content for maximum germination. The germination stage will range from 45 to 60 days. General care and maintenance shall consist of the proper watering, fertilizing and cleanup during the germination and establishment period of growth.

Note: In low visibility and general erosion control areas, begin the actual hydromulching after all existing vegetation has been removed by a single spraying of a non selective systemic herbicide followed by four days without rain. Once desiccated vegetative material has been removed mechanically, the hydromulching process can occur.



## SITE FURNISHINGS

### GENERAL INFORMATION

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#### General Information

The wide variety of furnishings that exist on Post can be a major unifying element. The following group of standard features are intended to tie distant and dissimilar areas of the installation together. They are compatible with each other as well as with the architectural standards of this guide. Substitutions will be considered on a case by case basis.

In some situations, in particular Land Use Zones, two or more alternatives for the same item are permitted. In most cases general guidance is given for the selection of alternatives with the determining factor being the surrounding context for that particular item.

The following standards are generic in nature and suggest materials that are widely available **as** manufactured items. Specific products have been avoided but such items, if proposed, will be considered on a case by case basis.

In the location or siting of any item, a consideration of likely or practical use is to be made. Items are to be grouped and handicapped considerations are to be made. Dual functions for design elements are to be considered in all applications.

Due to the high rate of change in building and area uses on Post, furnishings are to be relocated wherever possible. This will assist in maintenance efforts as well. Generally, materials are to have natural finishes, such as stained wood or concrete, to reduce maintenance requirements.

The paving and base materials for each application is to match that of adjacent paving materials. In cases where the existing pavement is broken or substandard it is to be replaced.

The standard finishes for all site furnishings shall be as follows;

Concrete – Federal Standard **595-A #33717**, cream color is to be integrated into the **mix**. Existing concrete is to be sand blasted to a natural finish.

Metals – Painted/baked enamel Federal Standard **595-A #20059**, or finish is to be bronze anodized aluminum.



## SITE FURNISHINGS

### GENERAL INFORMATION

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Woods – Federal Standard **595-A** #20059, dark brown semi-gloss enamel or flat solid type stain.

All wood is to be pressured treated Southern Yellow Pine, unless otherwise specified, or as supplied by manufacturer and stained on **Post** or at site.



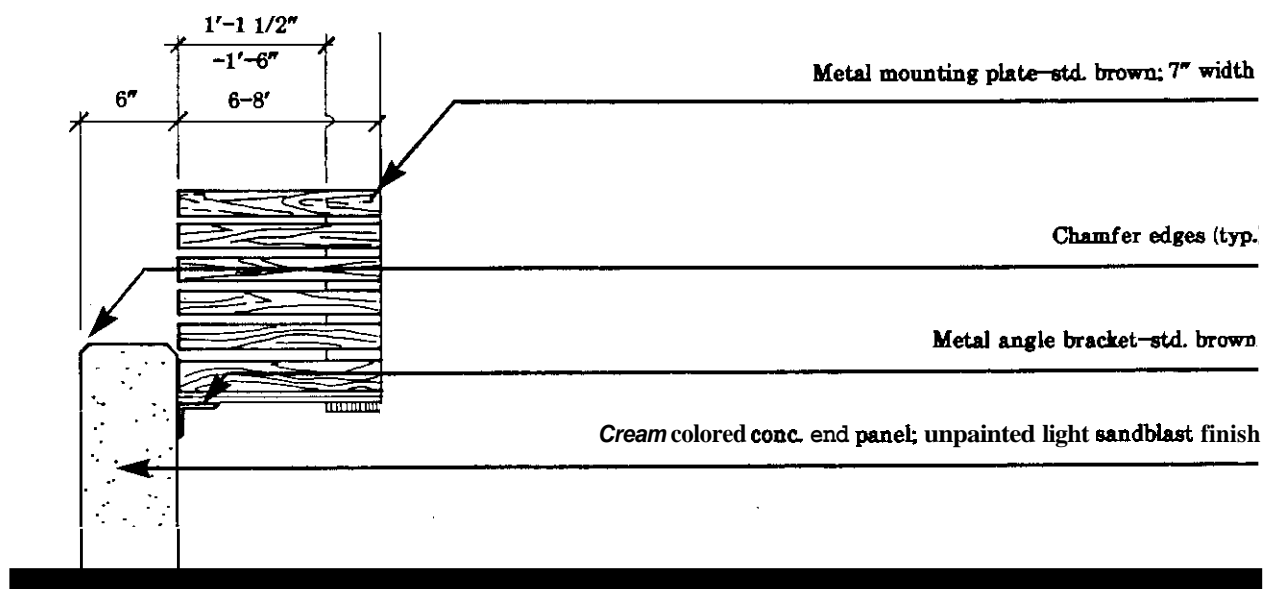
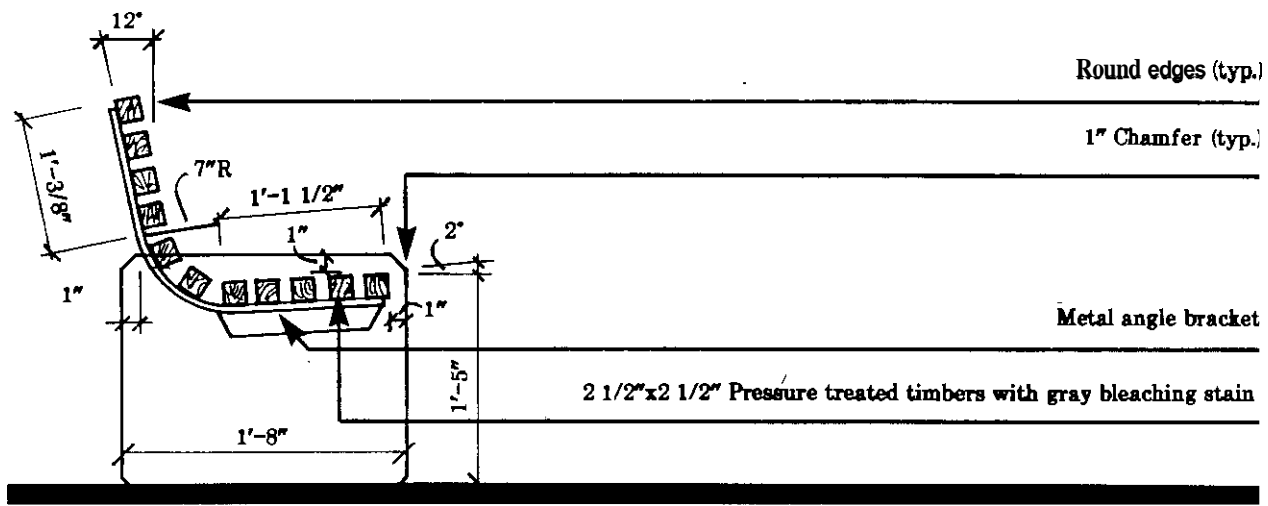
## SITE FURNISHINGS

### BENCHES

#### Benches

Benches are important in creating a “people friendly” environment. They are to be used in every location where people may need to wait, gather, rest or relax.

The bench below is to be used in outdoor parks or long term seating situations in the Administrative and Community Facilities Zones. Groupings of this bench are recommended to stimulate leisure time conversations.





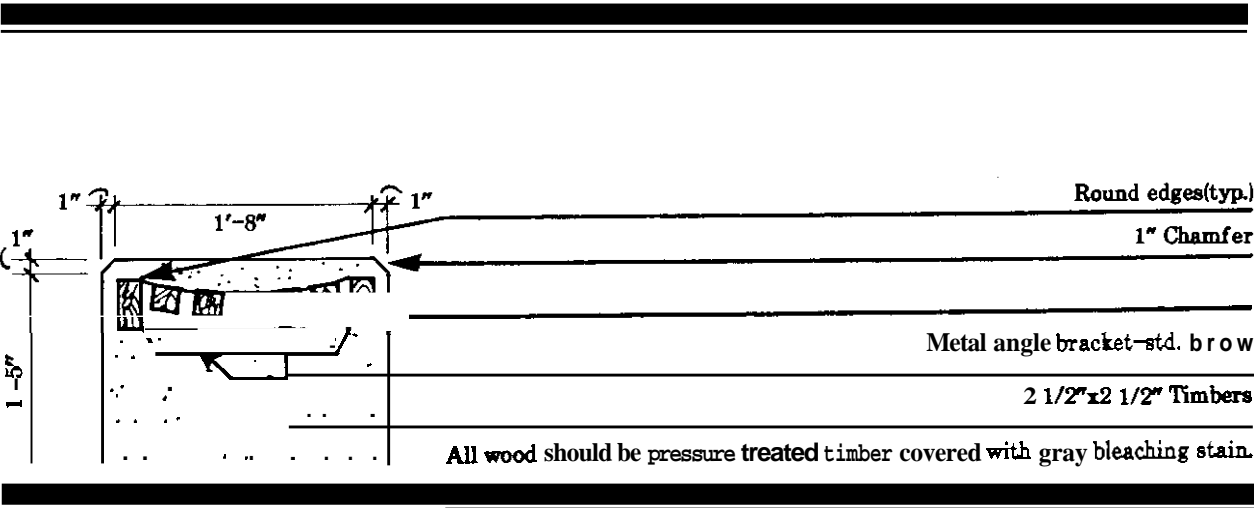
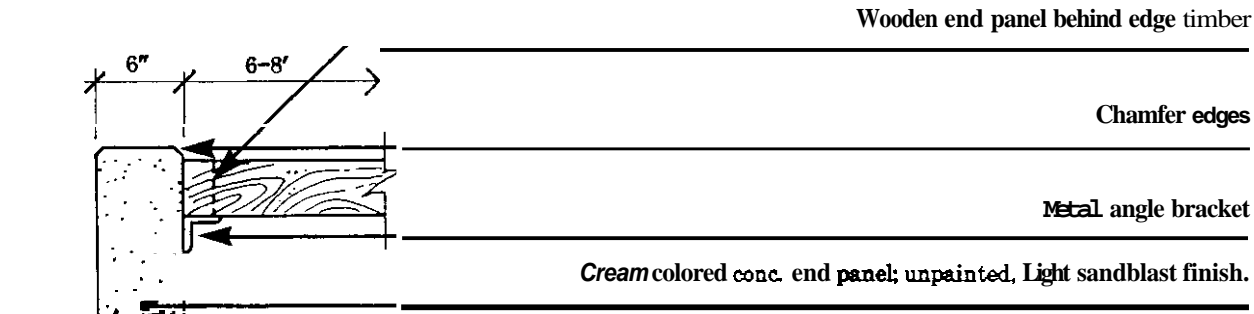
SITE FURNISHINGS

BENCHES

Bench Without Back

The backless bench can be used for short term seating situations at drop-off or entry areas and as a less expensive supplement in long term seating areas.

Locate benches to take advantage of attractive views and likely users' access and needs. Do not allow benches to encroach upon or crowd walkways, and do allow room for strollers, bikes and possible future site furnishings alongside each bench.



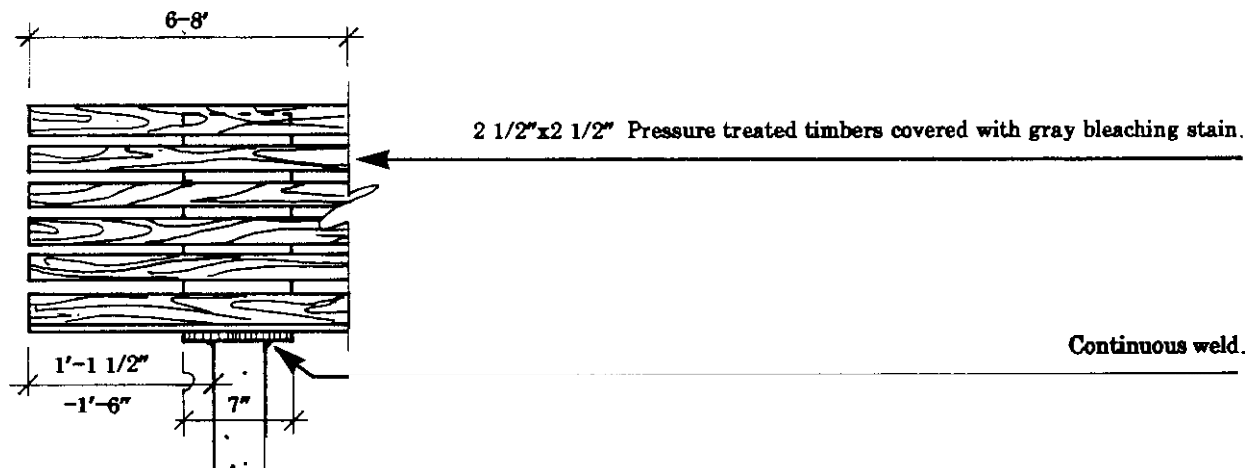
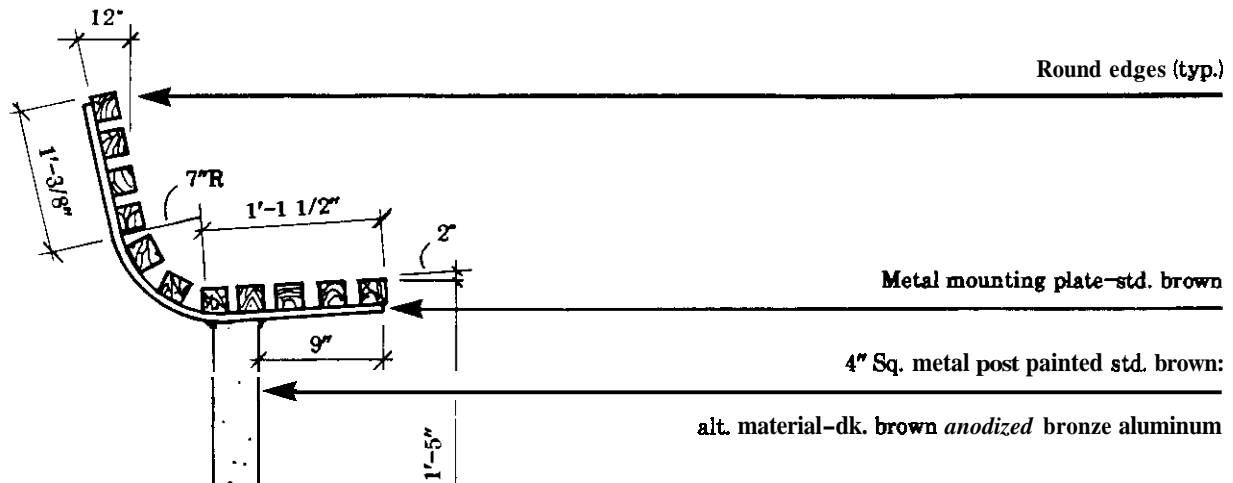
The bench above is to be used in the Administrative and Community Facilities Zones only.

## SITE FURNISHINGS

### BENCHES

#### Bench With Back

The bench below is to be used in outdoor parks or long term seating situations in every zone except the Administrative Zone and the Community Facilities Zone.



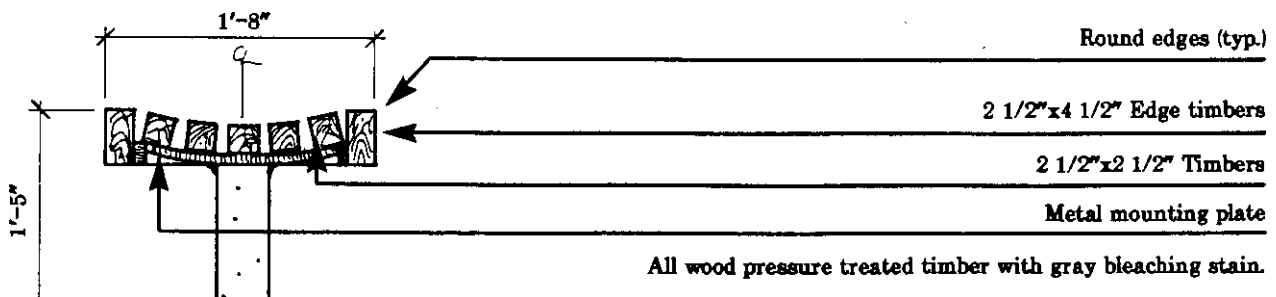
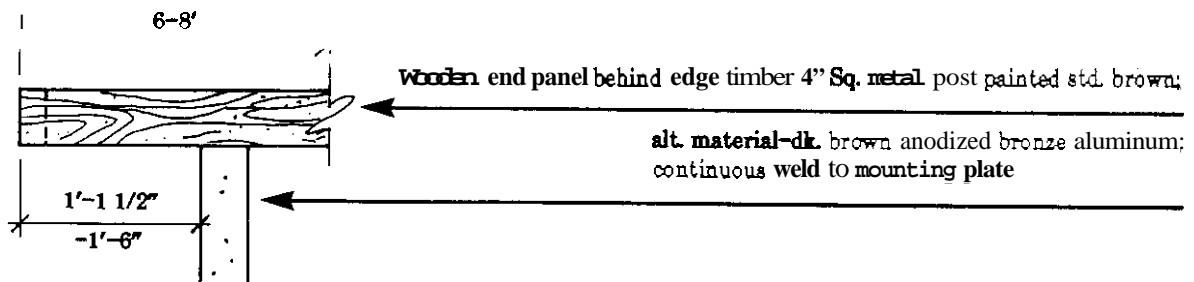
## SITE FURNISHINGS

### BENCHES

#### Bench Without Back

Use this backless bench in short term seating situations such as at drop-off or entry areas and as a less expensive supplement for established long term seating areas in all zones except the Administrative Zone and the Community Facility Zone.

Locate benches to take advantage of attractive views and likely users' access and needs. Do not allow benches to encroach upon or crowd walkways, and do allow room for strollers, bikes and possible future site furnishings alongside each bench.



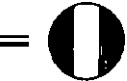
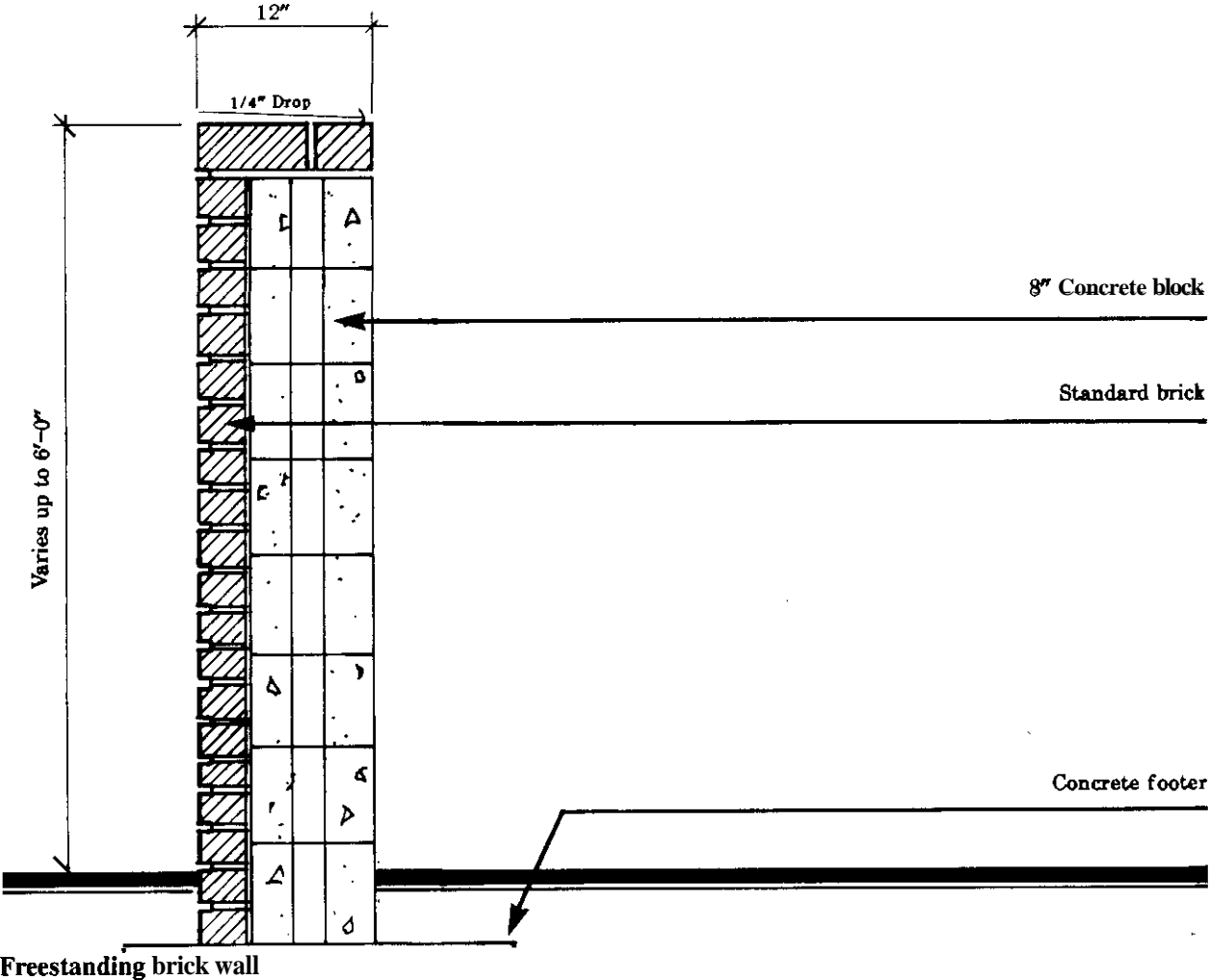
SITE FURNISHINGS

WALLS

Walls

Walls are used to screen views and deny access. Walls are preferred over fences since they provide a sense of permanence, are less susceptible to vandalism, and usually require less maintenance.

Use this wall for security, noise abatement, or as an architectural screen where needed. When built adjacent to a building, the brick types are to match as closely as possible.

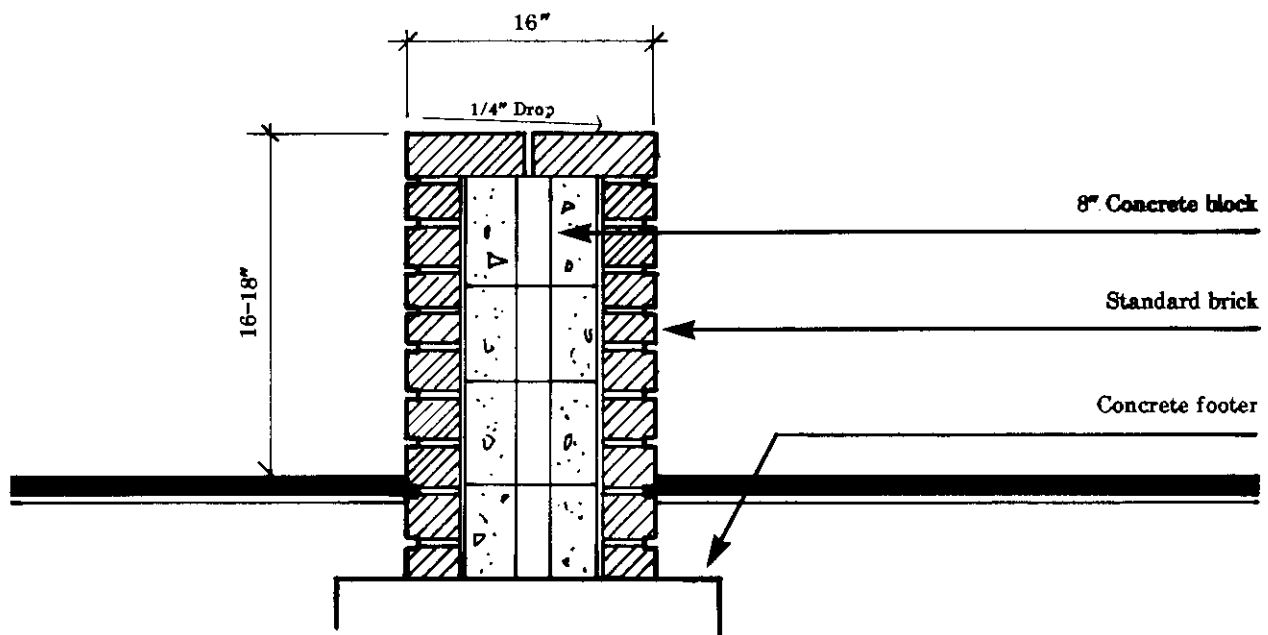


## SITE FURNISHINGS

### WALLS

#### Brick Seat Wall

The brick seat wall may be used in all Zones and may be used in conjunction with the freestanding brick wall shown on page 5.3.1. The recommended height is 16 to 18 inches. Seatwalls are useful in courtyards or plazas. Seat walls can form planters or can be used as a retaining wall. When built adjacent to a new building, the brick types are to match that building as closely as possible.



Freestanding brick seat wall



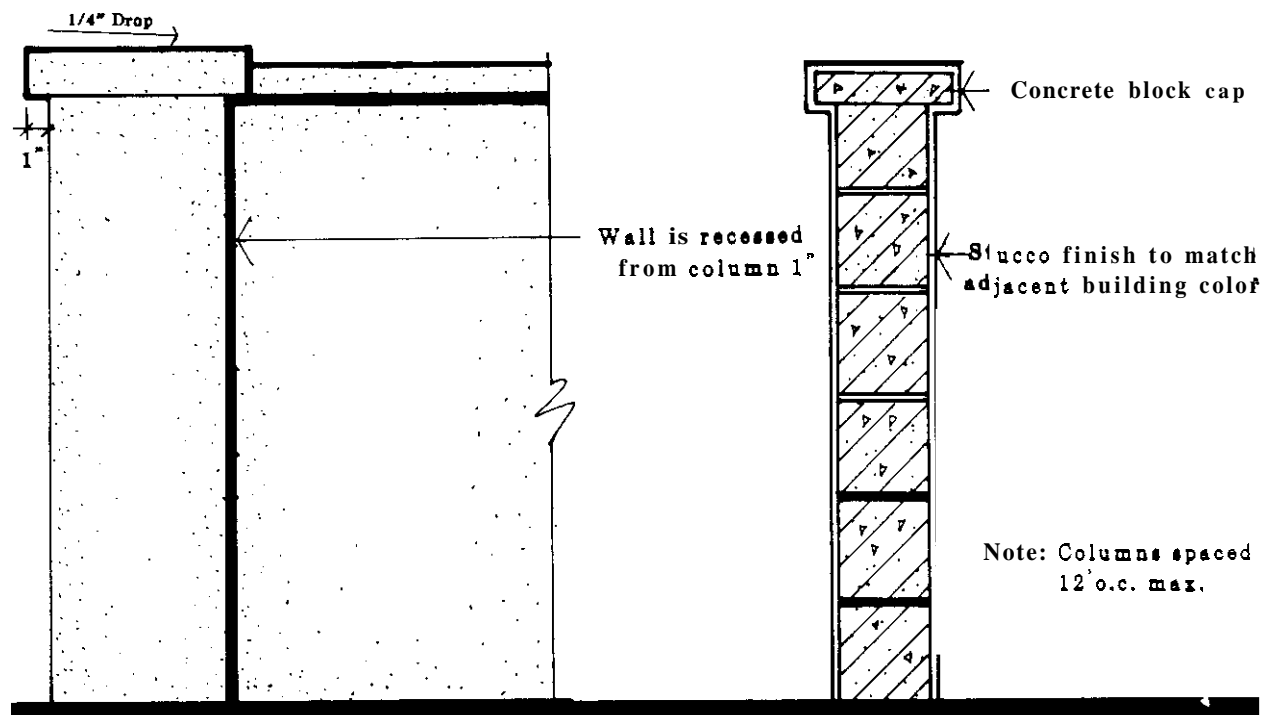
## SITE FURNISHINGS

### WALLS

#### Stuccoed Freestanding Wall

This freestanding stuccoed wall may be used in all zones and be up to **six** feet in height. If used as a seat wall, the height should be from 16 to 18 inches.

Use this wall for security, noise abatement, or **as** an architectural screen where needed. **The** stucco finish is to be compatible in both color and texture to adjacent buildings walls.



**Freestanding stuccoed block wall**

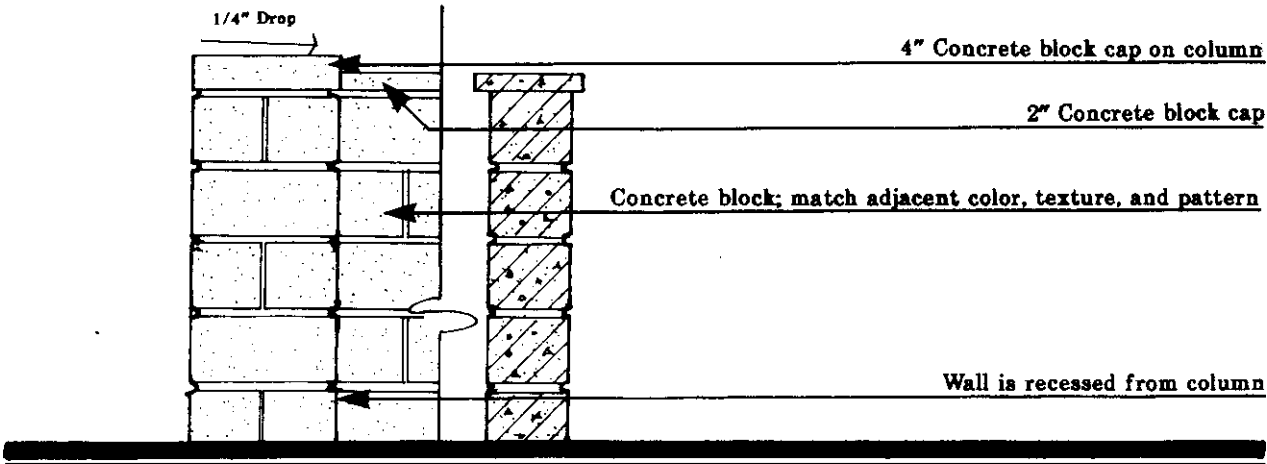


SITE FURNISHINGS

WALLS

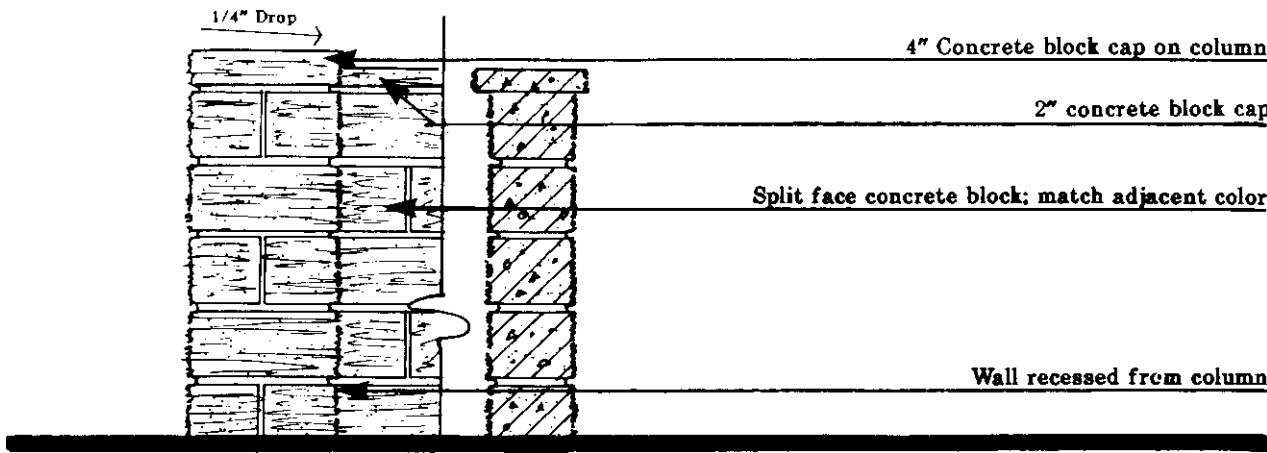
Concrete Block Freestanding Wall

This freestanding block wall is to be used as a screen, or for security purposes in the Mission Support, and Industrial Land Use Zones. When used adjacent to structures that utilize a stucco or stucco-like finish, this wall may be covered with a material that is similar in both color and texture.



Concrete block wall

The primary material for this wall in Family Housing areas shall be split face concrete masonry blocks with a matching split face concrete cap. The use of stucco or like material on existing walls is encouraged. Such stucco treatment on proposed walls shall be at the decision of the D.E.H.



Split face concrete masonry wall



# SITE FURNISHINGS

## WALLS

### Retaining Walls

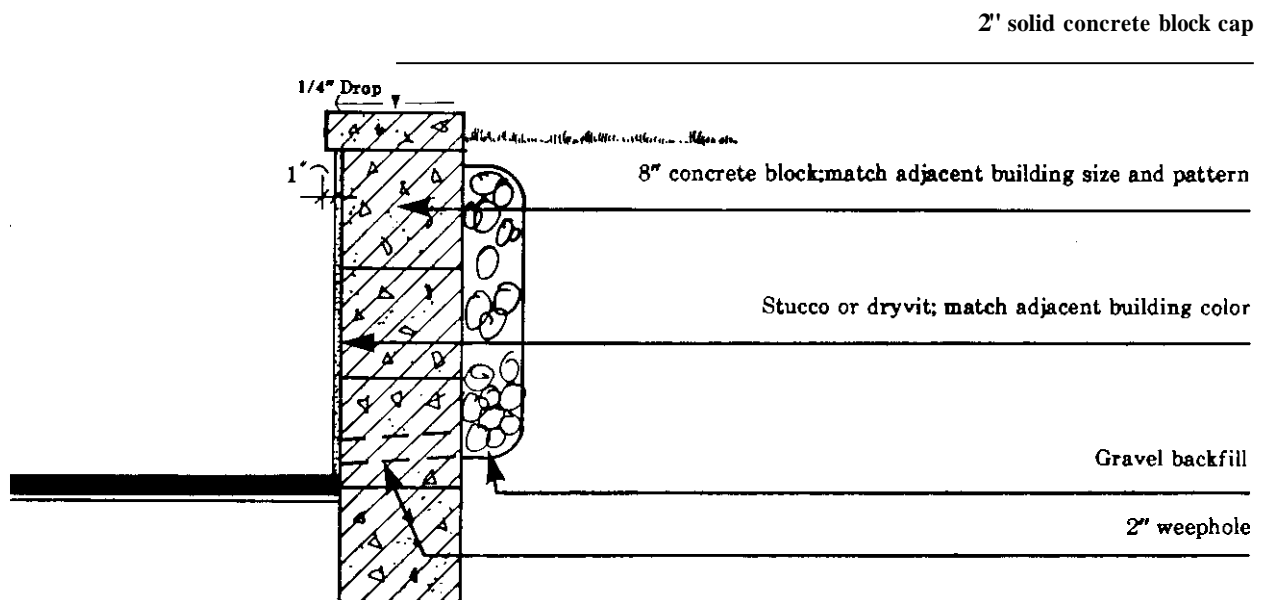
These walls retain soil and accommodate grade changes. The wall shall rise **4** inches above the finished grade at the top to prevent water and soil runoff over the wall. Heights of the walls vary and all require engineering approval. All retaining walls are to have weep holes which allow water pressure behind the wall to be released.

Retaining walls are useful for screening dumpsters, utilities or service and loading dock areas. They also make attractive planters and seatwalls. Plants placed at the top of a retaining seat wall must be carefully selected to avoid species that are spiny, thorny, invasive or that produce excessive litter.

### Concrete Block Retaining Wall

This block retaining wall may be used in Mission Support and Industrial **Land** Use Zones and can be up to five feet in height. If used **as** a seat wall the height should be from 16 to 18 inches.

If height is greater than 24", engineering approval is required.



Concrete block retaining wall





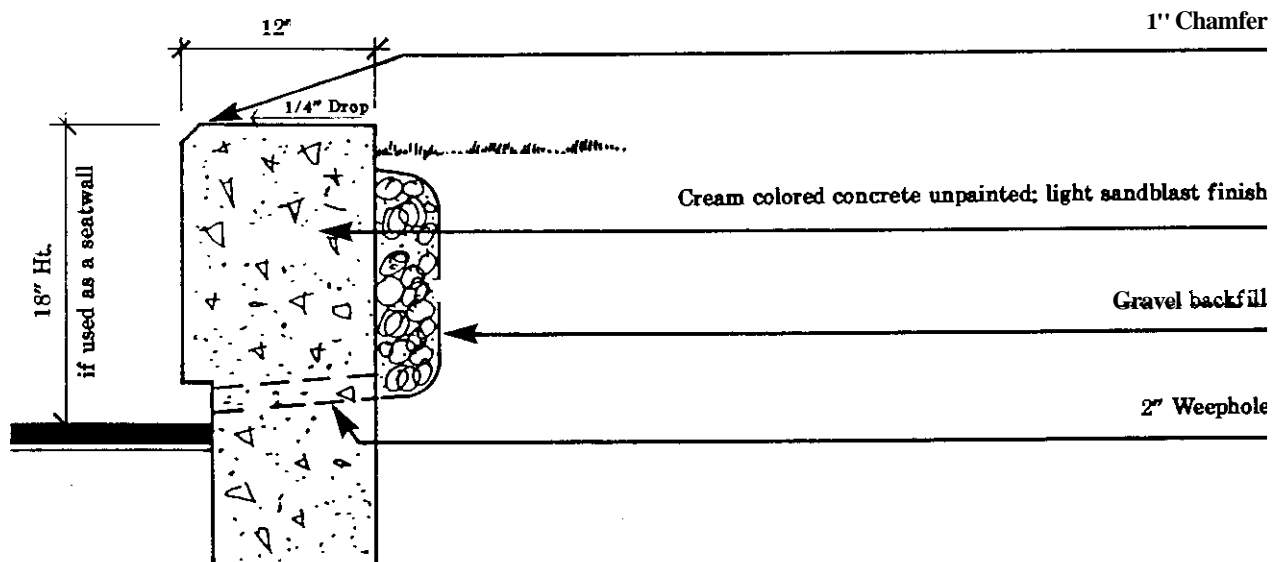
## SITE FURNISHINGS

### WALLS

#### Concrete Retaining Wall

This concrete retaining wall is unlimited in height, and may be used in Mission Support and Industrial Land Use Zones. If used adjacent to structures that utilize stucco or stucco-like finish, this wall may be covered with a material that is similar in both color and texture.

If height is greater than 24", engineering approval is required.



Concrete retaining wall



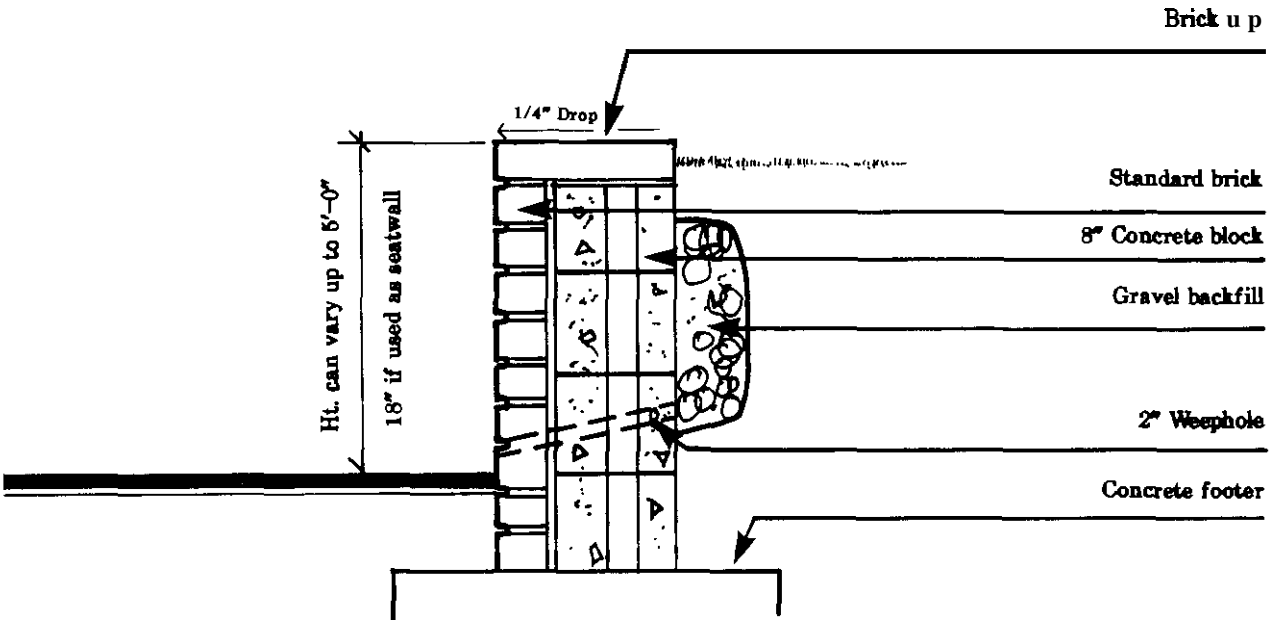
SITE FURNISHINGS

WALLS

Brick Retaining Wall

This brick retaining wall may be used in all Zones and can be up to five feet in height. If used as a seat wall the height should be from 16 to 18 inches.

If height is greater than 24", engineering approval is required.



Brick retaining wall



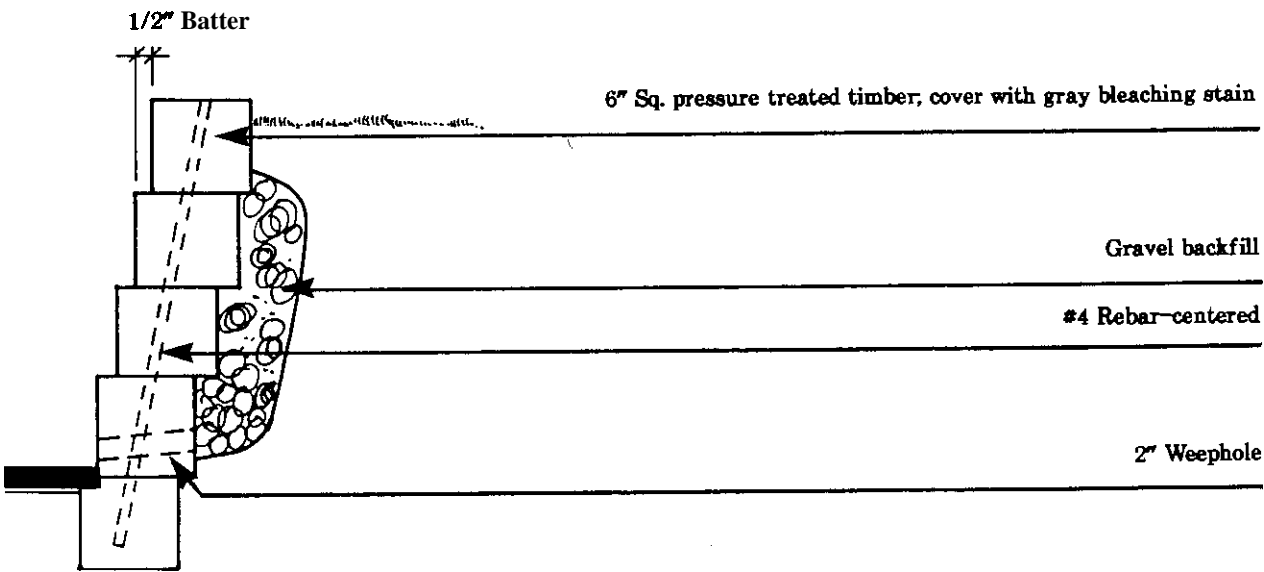
SITE FURNISHINGS

WALLS

Wooden Retaining Wall

This treated wood retaining wall may be used to a height of five feet only, and only in the Mission Support, Housing, Open Space and Industrial Land Use Zones.

If height is greater than 24", engineering approval is required.



Wooden retaining wall



## SITE FURNISHINGS

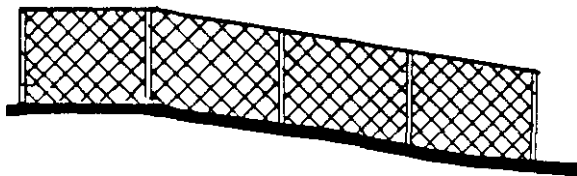
### FENCES

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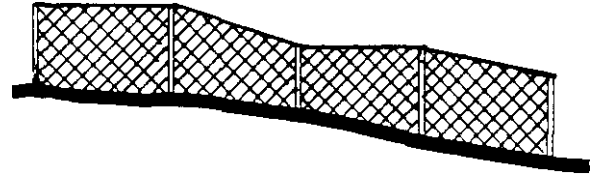
#### Fences

The purpose of fencing is to provide security for dangerous or vulnerable areas and screening of visually unattractive areas. The following general guidelines shall be applied to all fencing at Fort Jackson:

- o Screen fences or wall shall be at least as tall as the materials or equipment being stored or screened but not to exceed 10 feet in height.
- Fences shall not be placed on bermed areas. They are to be placed at the base of a bermed area, either front or back.
- All fencing on sloping terrain is to have a smooth alignment to avoid a jerky, disrupted look.



Smooth alignment recommended



Uneven alignment not recommended

#### Fence Alignment



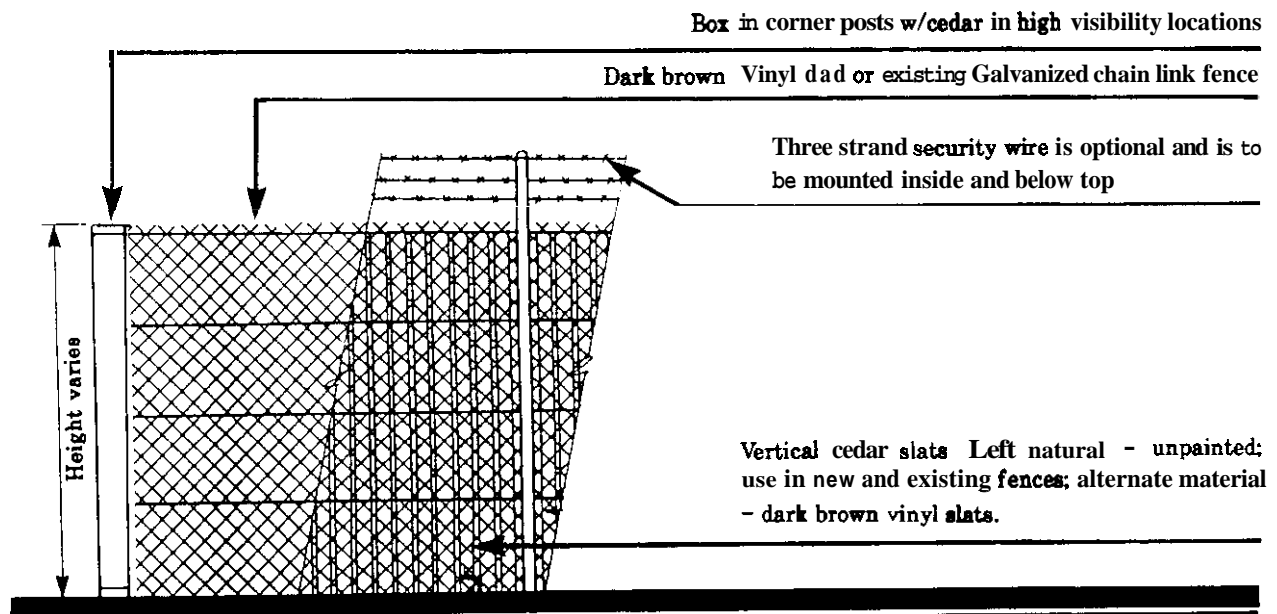
## SITE FURNISHINGS FENCES

### Chain Link Fence

This utility/security fence is to be used in high visibility areas of all Land Use Zones where physical security **is** required. The three strand security barbed wire is to be used as needed.

All such fencing in the Administration, Community Facilities, Housing and Open Land Use Zones is to be vinyl-clad. Existing fences in these zones are to be painted, replaced, or the mesh fabric is to be replaced with vinyl-clad fabric and all other posts and hardware painted standard **dark brown**.

All such fencing in the Industrial and Mission Support Land Use Zones shall receive the same treatment only at points of entry and administrative/headquarters/high visibility areas. All other fences in these zones will be galvanized.



Chain link fence

## SITE FURNISHINGS

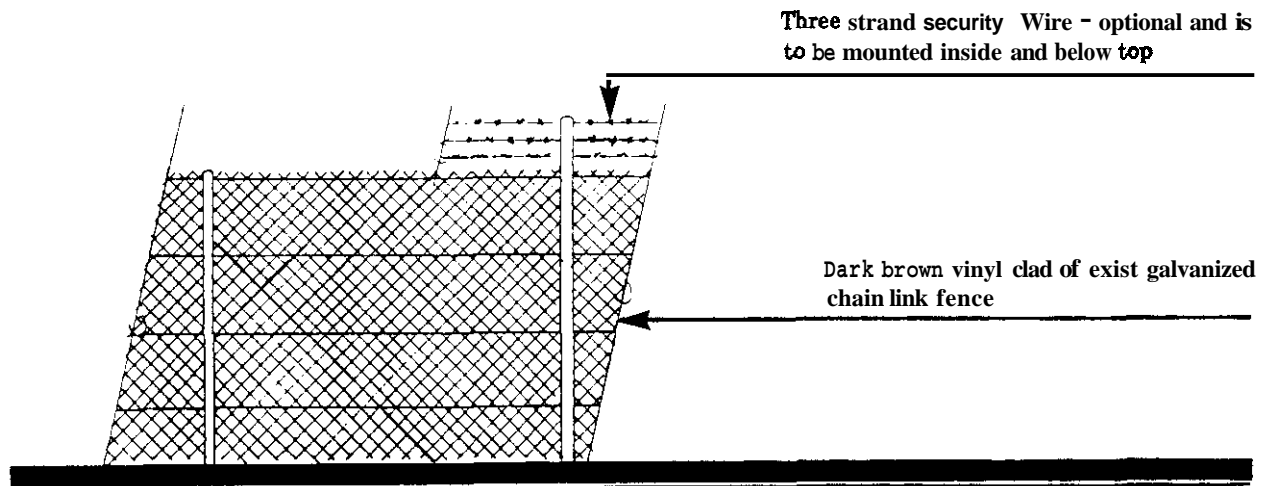
### FENCES

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#### Chain Link Fence

All perimeter fencing shall be galvanized except at major entries where it shall be vinyl coated for a distance of two hundred feet (200') on both sides of the gate. The use of higher design quality walls and fences is encouraged at these gate areas.



Chain link fence

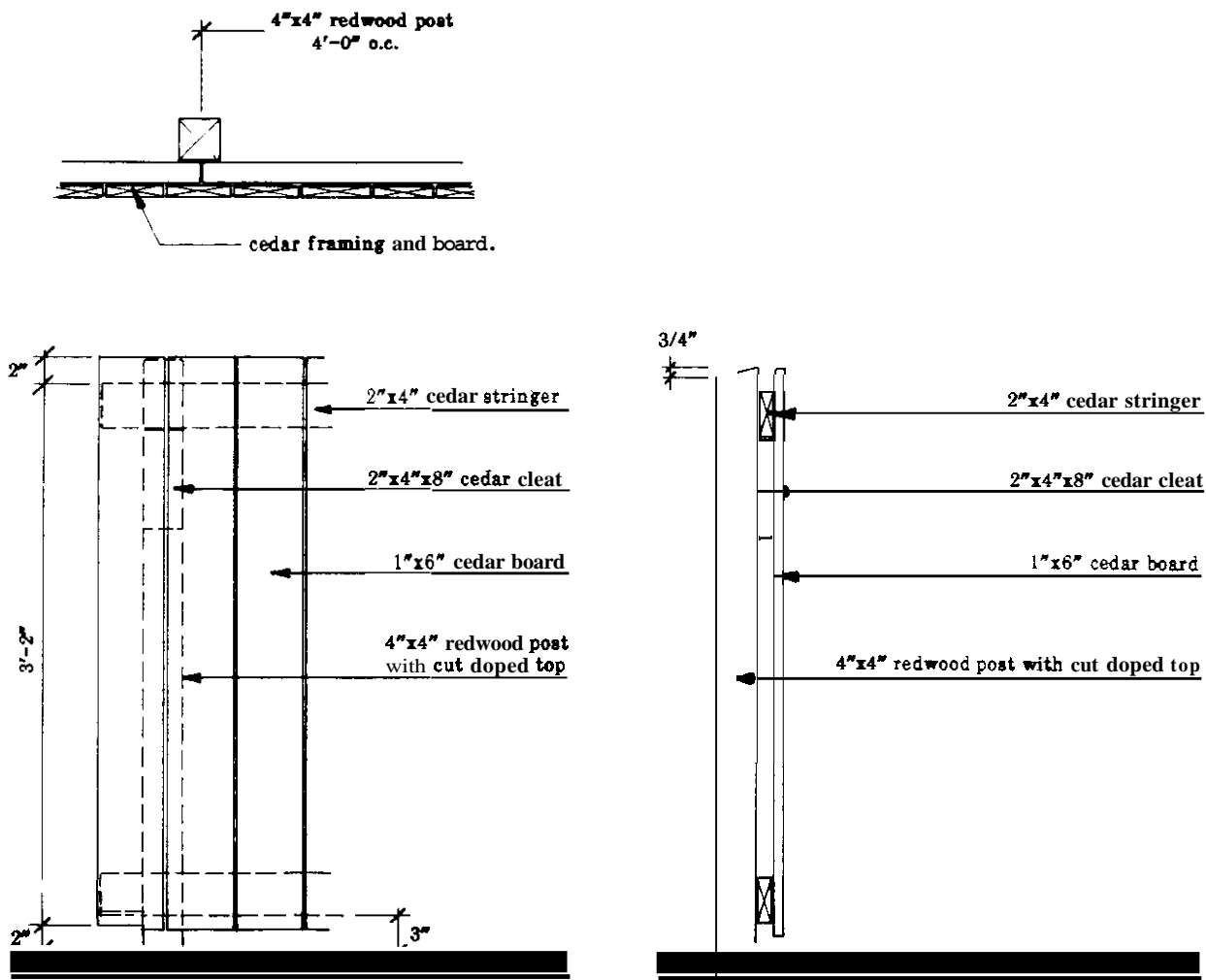


SITE FURNISHINGS

FENCES

Wooden Privacy Fence

This wooden fence is to be used for privacy fencing in residential areas. The panels are standardized to allow prefabrication. Redwood and cedar fencing material shall not be painted or stained. Top of posts are to be leveled as shown to insure water run-off.



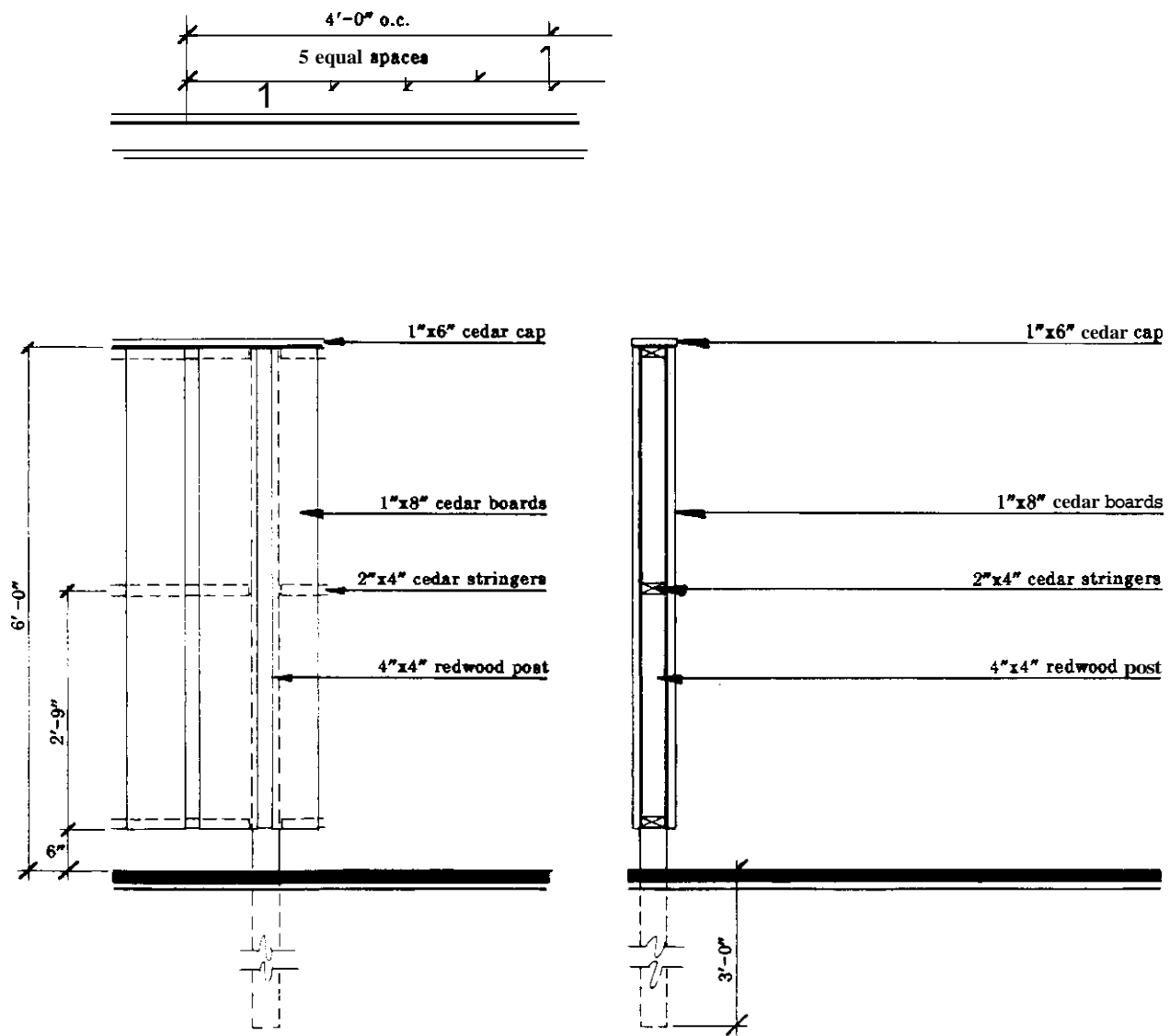
Wooden Privacy Fence - Alternative 1

SITE

NISHINGS

FENCES

Wooden Privacy Fence



Wooden Privacy Fence - Alternative 2



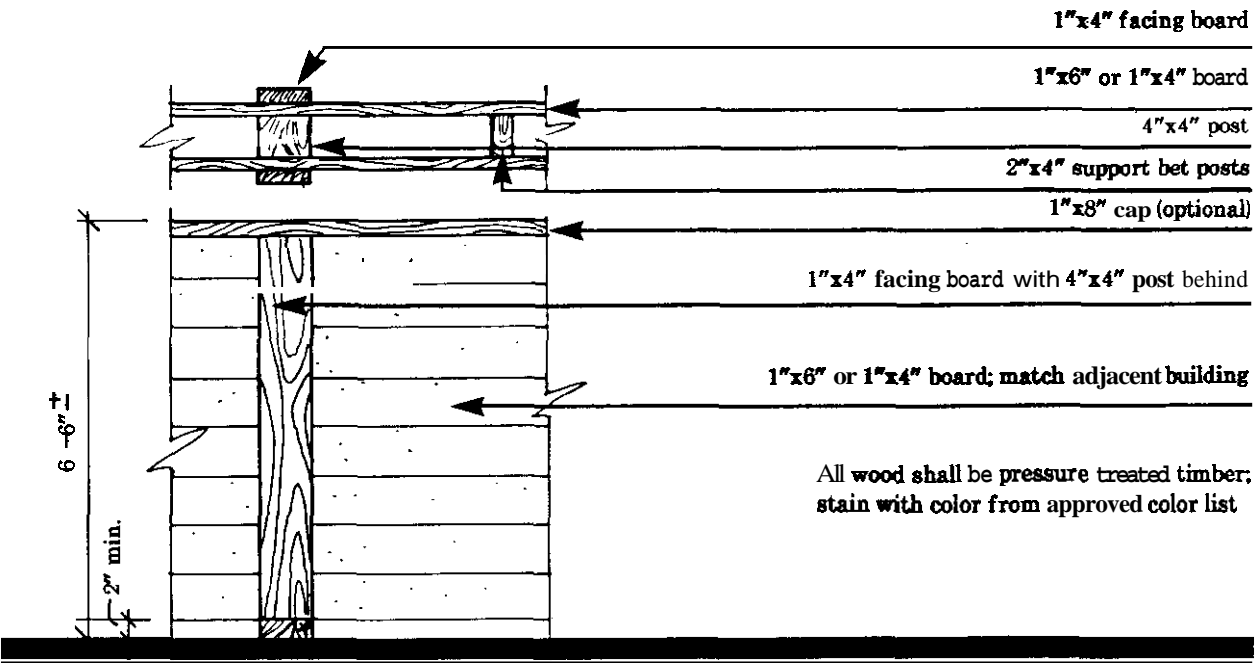


SITE FURNISHINGS

FENCES

Wooden Fence

This wooden fence is to be used in conjunction with all temporary wood frame buildings with horizontal siding now in use on Post.



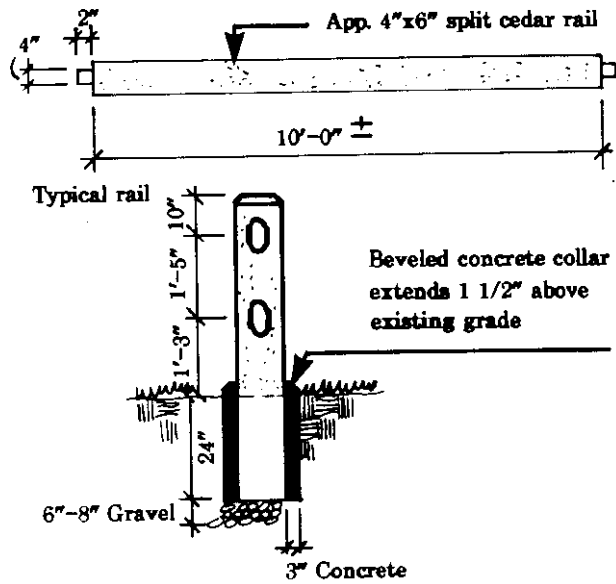
Wooden fence



## SITE FURNISHINGS

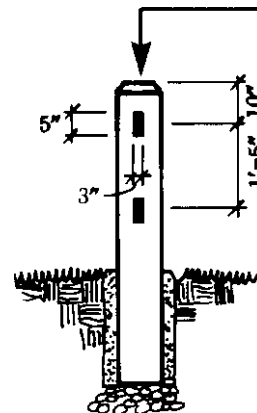
### FENCES

#### Wooden Split Rail Fence



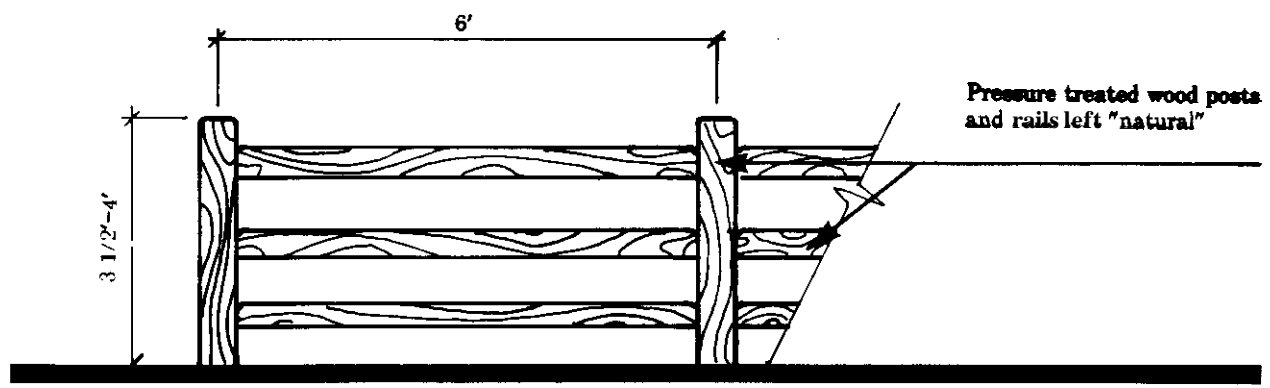
Note: all wood is to be commercial grade split cedar.

App. 6" square split cedar post  
pierced with 3"x5" holes



Note: Post sets on gravel

Typical post



Wooden split rail fence

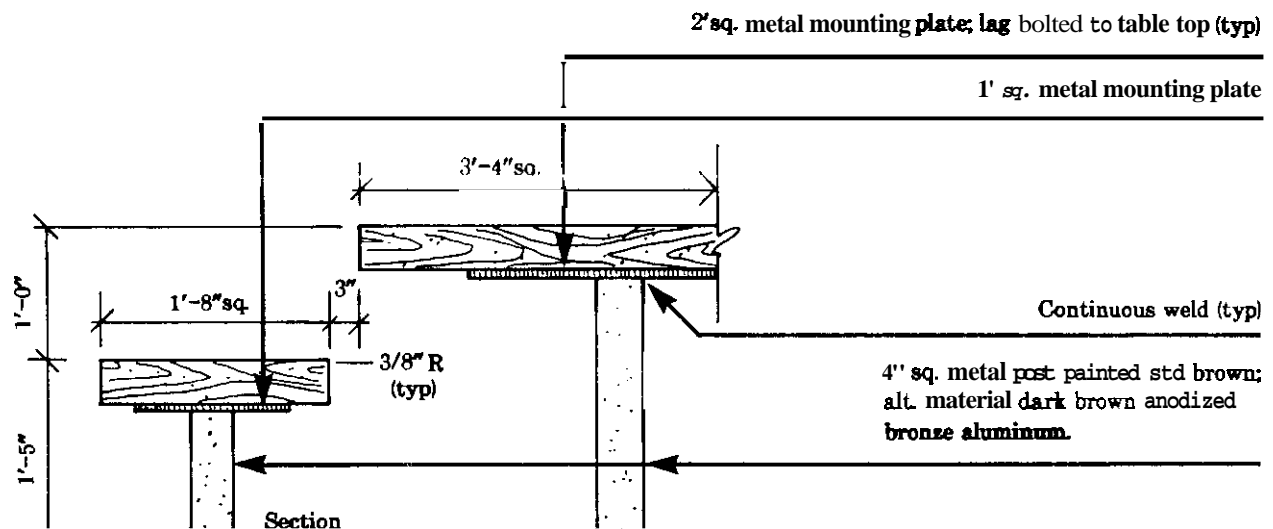


## SITE FURNISHINGS

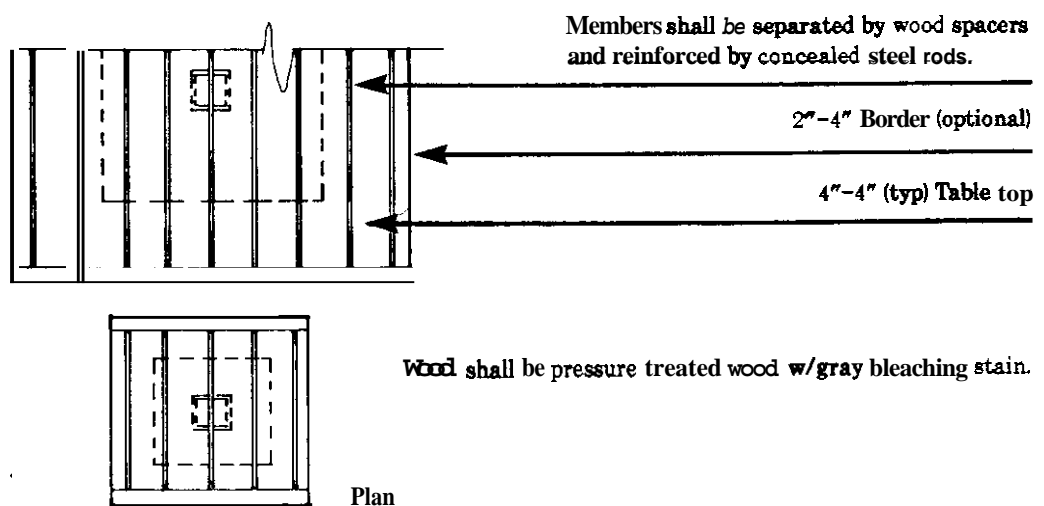
### GAME TABLES & SEATS

#### Game Tables & Seats

This game table with seats is to be used in outdoor recreation and employee seating areas where users regularly gather at lunch time or during leisure hours. In groupings of three or more, one table shall have only three seats leaving the fourth side open for handicapped access.



Section



Plan

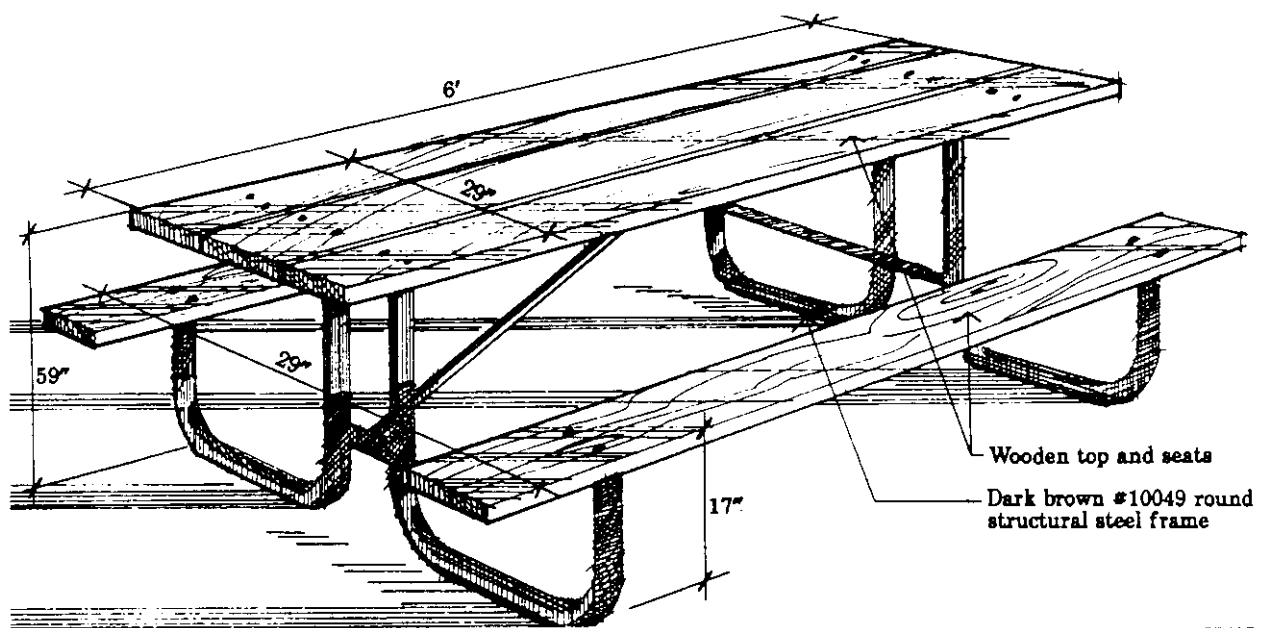


## SITE FURNISHINGS

### PICNIC TABLES

#### Picnic Tables

This table is to be used in all Land Use Zones as required. All edges and corners are to have a minimum 3/8" radius and be free of cracks and splinters. In groupings of 3 or more tables, one end of one table is to be extended 1'-6" for handicapped access, and that table is to be located on a paved or smooth surface.



Picnic table



SITE FURNISHINGS

SHELTER/KIOSK SYSTEM




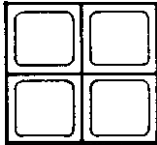
Shelter/Kiosk System

This multi-purpose modular system is readily available from a variety of manufacturers or can easily be fabricated on Post. The basic system is of 4" x 3" tubular aluminum posts with a white acrylic roof dome.

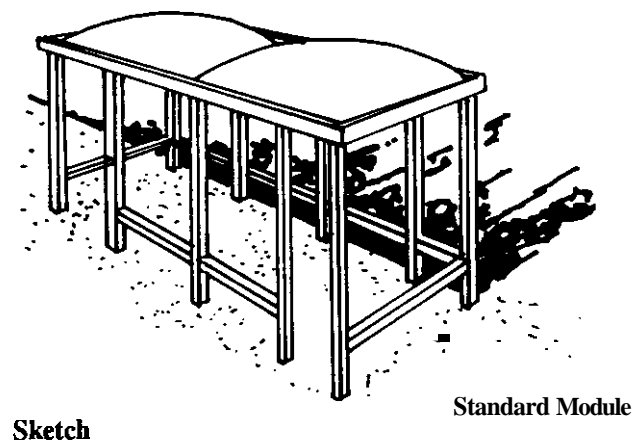
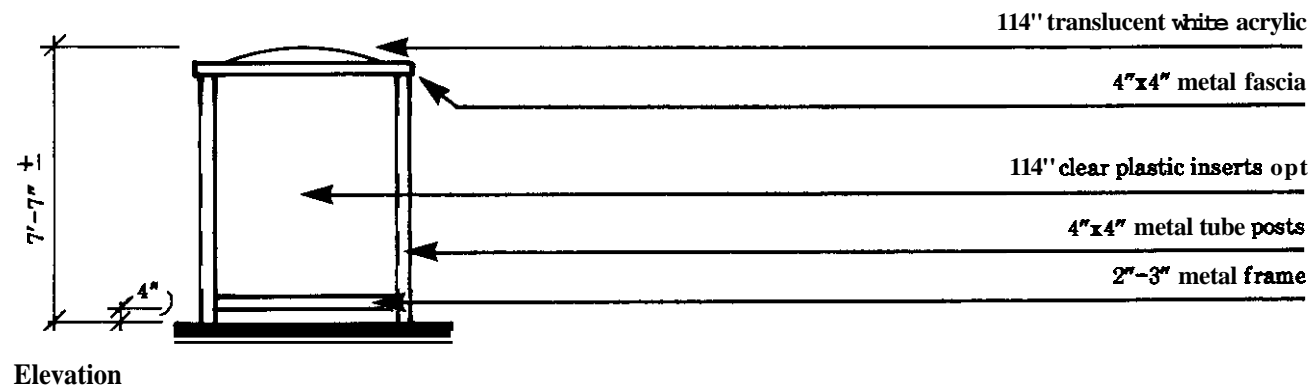
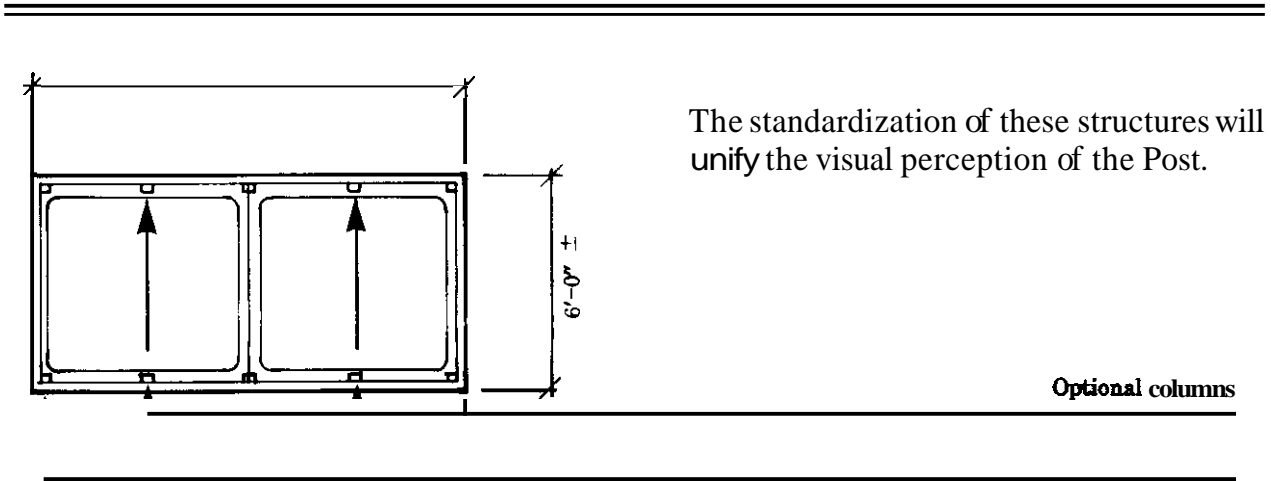
The units are *to* be used for weather protection as bus stops, school bus stops, equipment covers and **as** guard booths. Larger groupings may be practical as playground pavilions with the plastic side panels removed. **An** additional use is as information kiosks in high traffic pedestrian areas.

Streetside locations should allow for adequate safe access for pedestrians by setting back a minimum of four feet from the curb.

The standard bench and trash receptacles is *to* be used in conjunction with two, three and four unit combinations.

Standard Module Combinations	Uses
<div></div> <div>1/2 unit</div>	Kiosk, vending machines and guardhouse
<div></div> <div>1 unit</div>	Bus shelter and vending machines
<div></div> <div>1 1/2 units</div>	Bus shelter and vending machines
<div></div> <div>2 units</div>	Bus shelter and utility shelter (center post is eliminated)
Plan (typ.)	





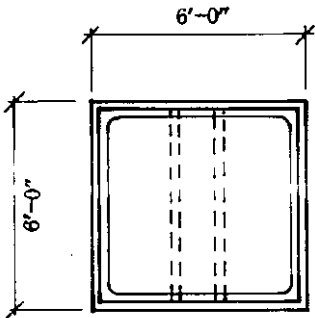
Note: All metal shall be covered with standard brown baked enamel paint; alternative material is bronze anodized aluminum.



SITE FURNISHINGS

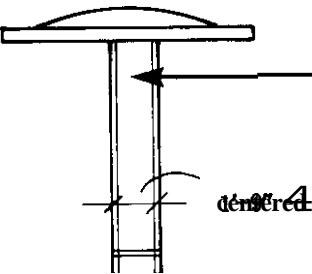
SHELTER/KIOSK SYSTEM

This kiosk/bulletin board system has a variety of uses, including basic information boards, pedestrian scale marquees for community facilities, dispensing racks, telephones, or as formal graphic displays for Post or Small Area directory maps.

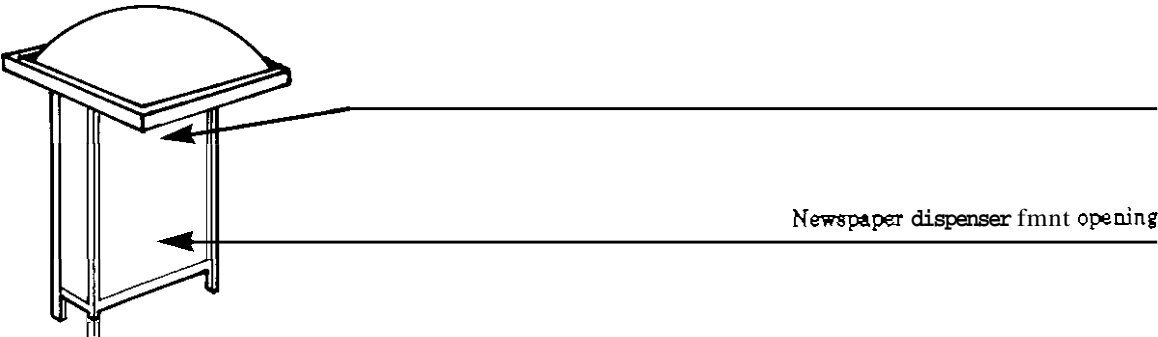


Plan

Note This is 1/2 a standard module



Elevation



Sketch



SITE FURNISHINGS

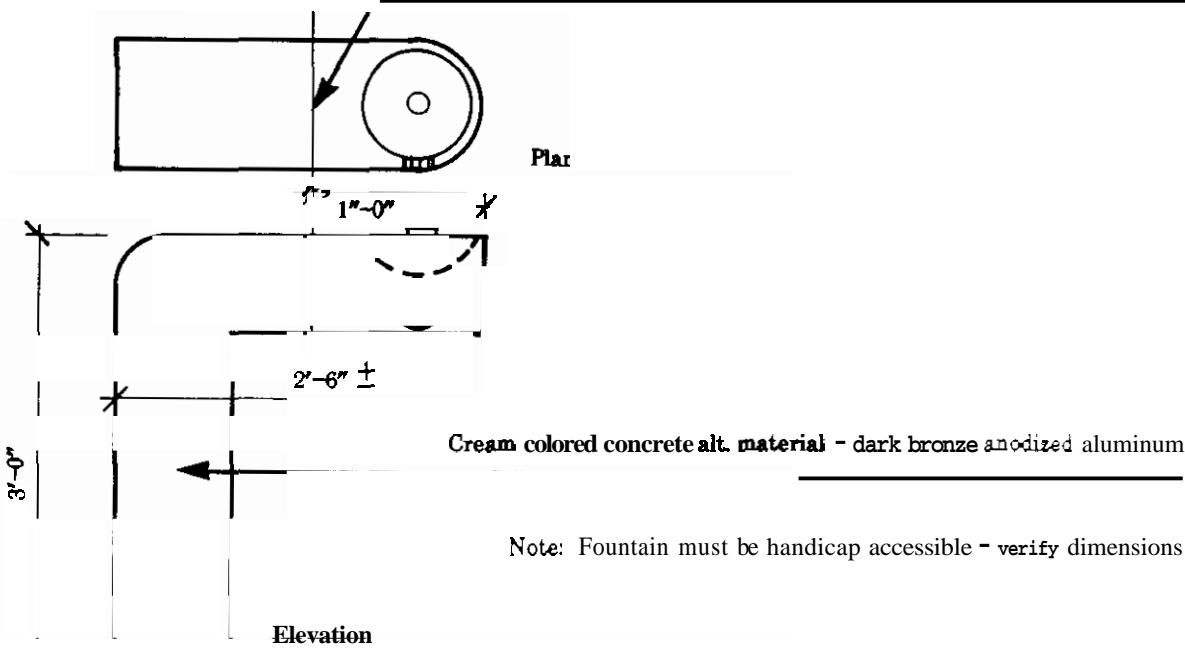
DRINKING FOUNTAINS

Drinking Fountains

Locate fountains in high traffic areas and outdoor gathering areas. Fountains are to have paved bases large enough to accommodate wheelchairs without blocking traffic on the adjacent walk. They are to be near existing potable water lines. In playground and community facilities areas, stepping blocks for children are required.

Note Provide subsurface drain valve for winterizing

Wall mounted cut-off option

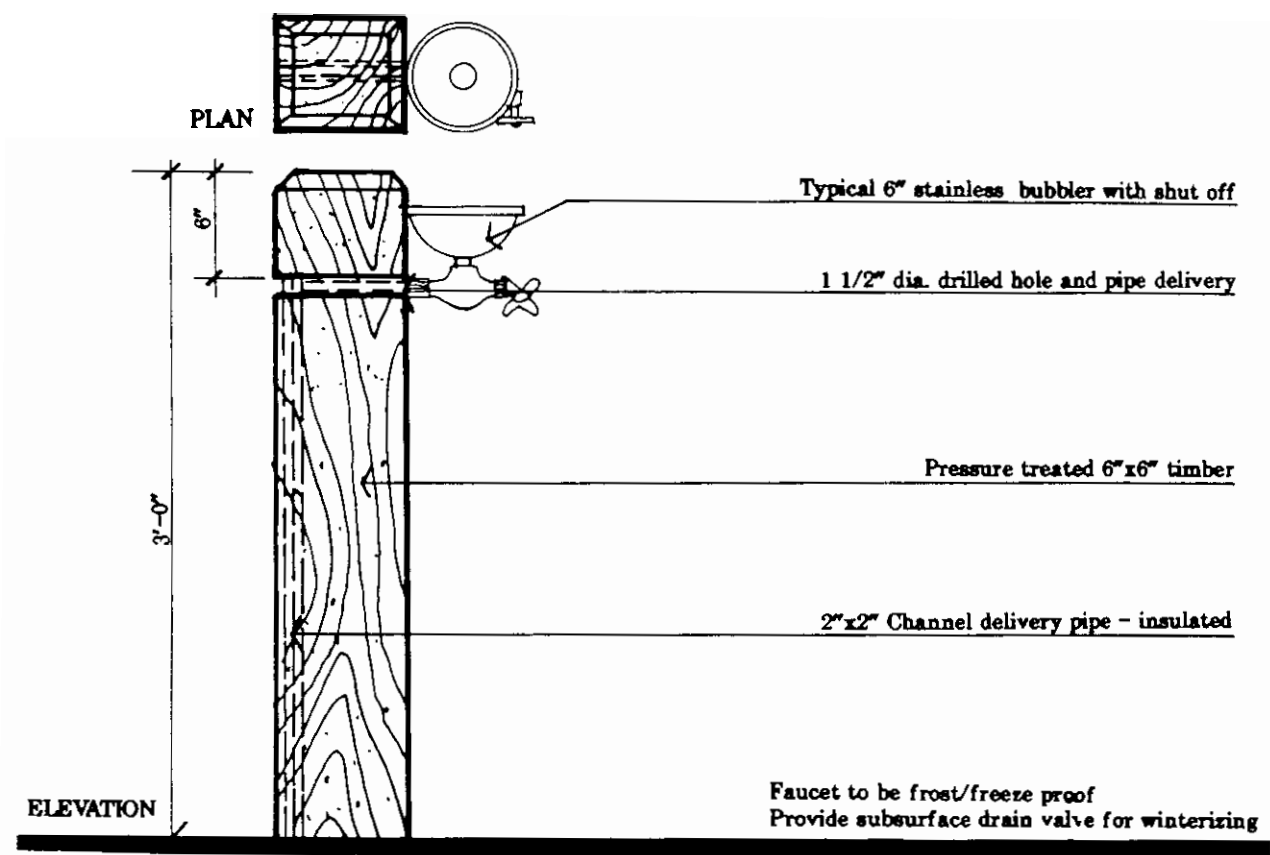




SITE FURNISHINGS

DRINKING FOUNTAINS

This alternate utility fountain is to be used in low visibility and remote areas of Housing, Industrial, Open Space and Mission Support Land Use Zones.



Drinking fountain

## SITE FURNISHINGS

### TRASH RECEPTACLES

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#### Siting Criteria

Trash receptacles shall be sited **as** follows:

- Large commercial facilities are to have several receptacles at each entry and exit and others by benches.
- All facilities are to have at least one trash receptacle at the main entry.
- There is to be one trash receptacle at all bus stops, major road intersections frequented by pedestrians, and at areas where several pedestrian paths intersect.
- There is *to* be at least one trash receptacle for every three picnic tables and at least one at every playground, ballfield and sport court.
- Trash receptacles are to be conveniently located so as to encourage use but not where they will detract from nice views. Receptacles in open areas are to be located near plantings or edges with other site furnishings.
- When placed along a path, sidewalk or in a courtyard or plaza they shall be placed where they will not obstruct or interfere with pedestrian traffic.
- An adequate number of receptacles is to be provided to avoid overfilling.

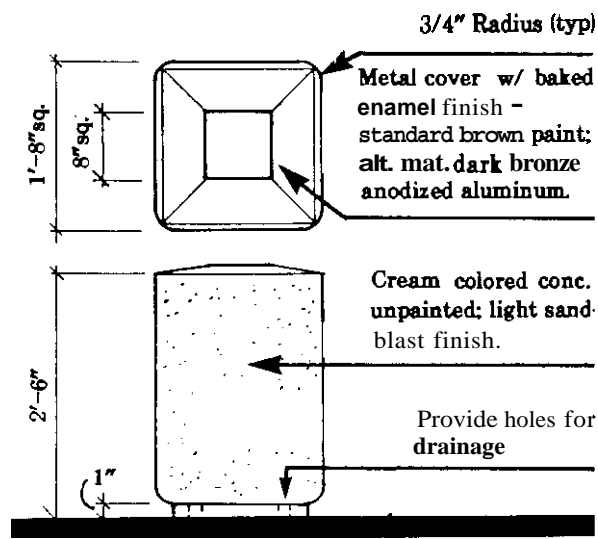


## SITE FURNISHINGS

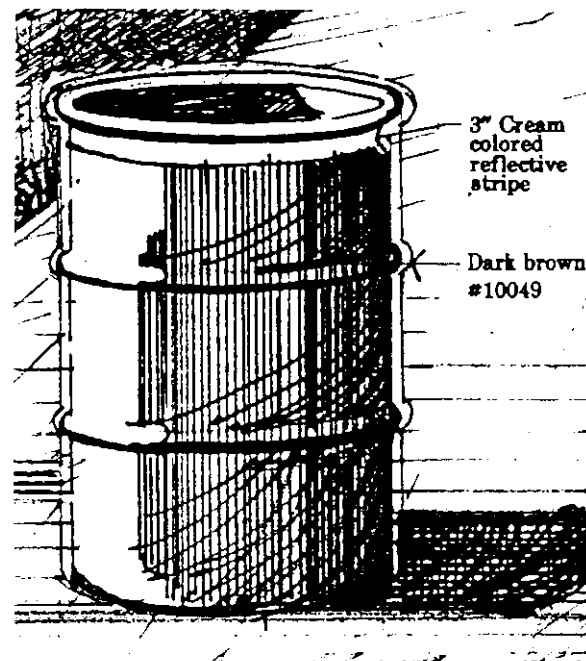
### TRASH RECEPTACLES

#### Trash Receptacles

This precast concrete container is to house a plastic liner can and the removable cover is to be attached by cable or chain to the main housing. **An** alternate utility trash receptacle made of recycled or new, undented, cleaned oil drums is permitted in low visibility areas of the Industrial, Open Space, and Mission Support Land Use Zones, and in enclosed service areas of all Zones. Such cans are to be painted a standard dark brown, high gloss enamel paint. A 3" white reflective stripe is to be applied immediately above the upper section band of each can.



Post-wide trash receptacle



Alternate utility trash receptacle



## SITE FURNISHINGS

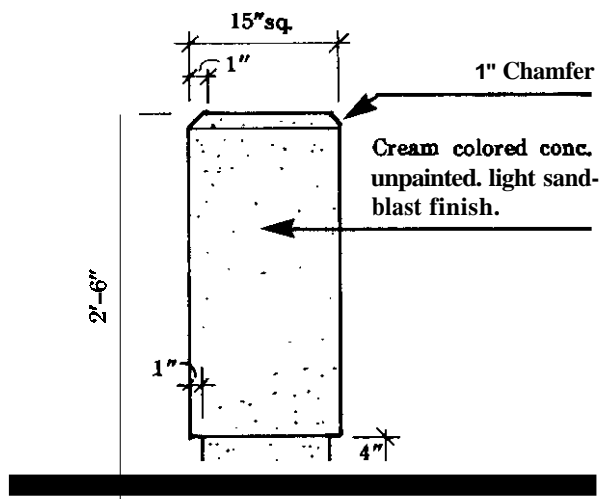
### BOLLARDS

#### Bollards

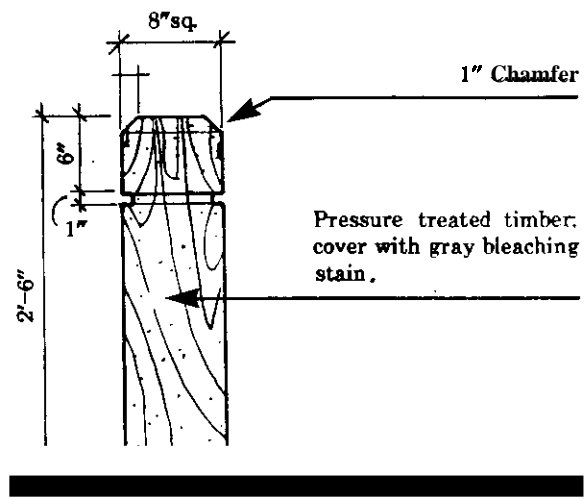
Bollards are to be used as vehicular/pedestrian traffic separators in areas where the designer deems this necessary, and to define plaza and memorial spaces. The use of a two inch diameter hole drilled ~~six~~ inches from the top to hold a one inch minimum dark bronzed or painted chain is permitted.

Bollards are to set a minimum of eighteen inches below grade and provisions should be made for emergency access into controlled areas.

Wooden bollards less than 8" square, with dog chain attached, are specifically forbidden for any exterior use on Fort Jackson.



Concrete bollard



Wooden bollard



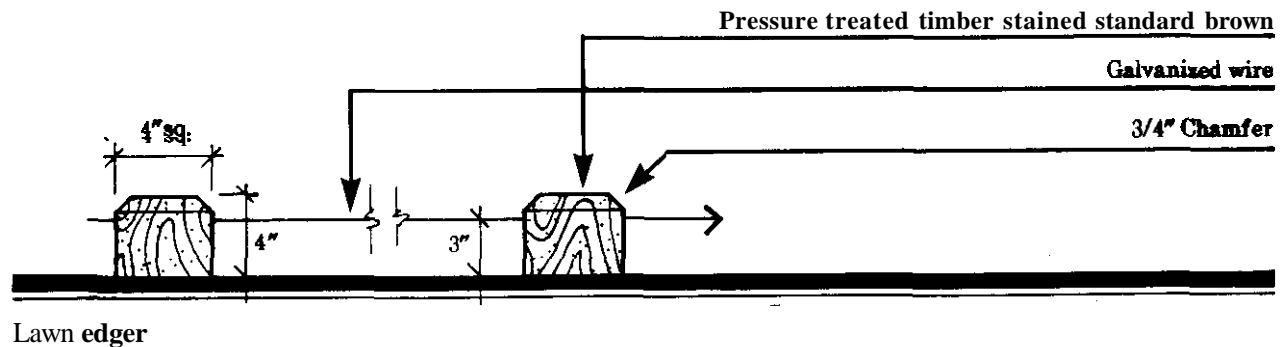
## SITE FURNISHINGS

### LAWN EDGER

#### Lawn Edger

Use this pedestrian control device along walkways in barrack areas to define space and protect lawns. The alternate method for controlling pedestrian movement is through well planned circulation systems that respond to trip origination/destination requirements, and through the use of groundcovering plant materials at intersections and obvious points of departure from walks.

Posts are to be set a minimum of 12" into the ground with the wire being tightly stretched and anchored.



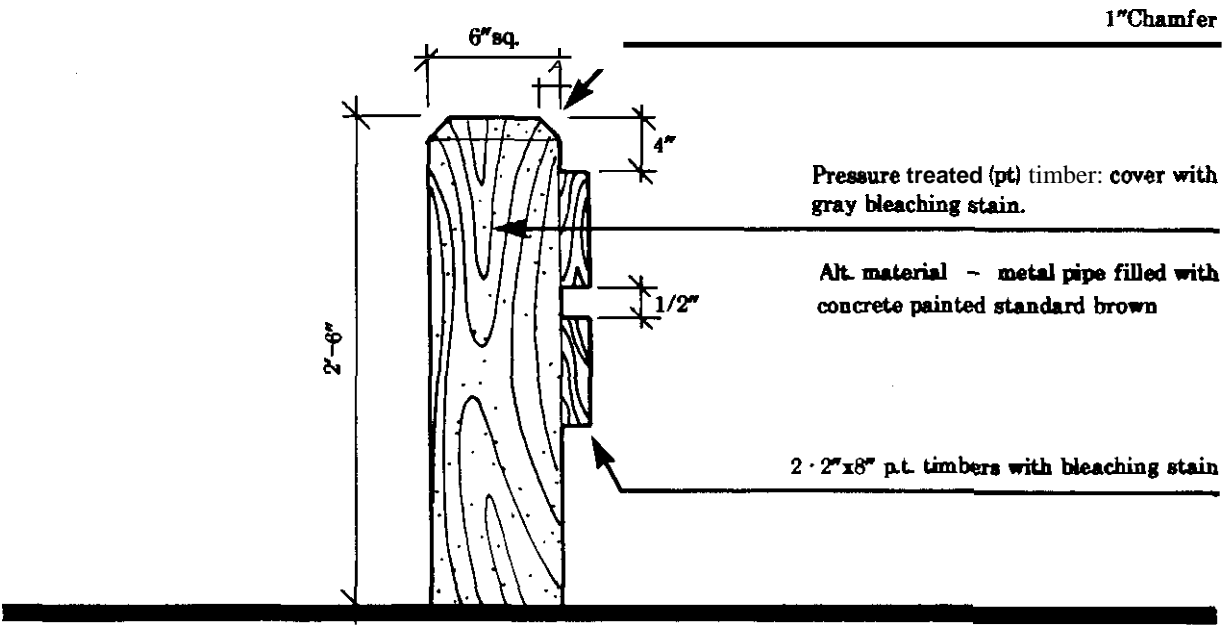
SITE FURNISHINGS

GUARDRAILS

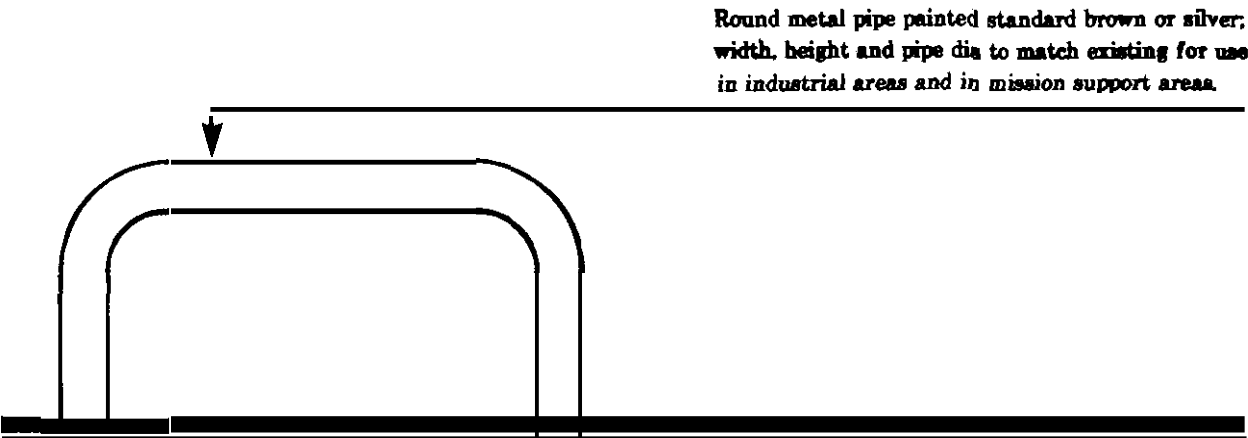
Guardrails

Guardrails are to be used in parking and other areas to define and control where vehicles are permitted to travel. This guardrail is not intended as a highway safety device. **An** additional use is to separate pedestrian from vehicular traffic.

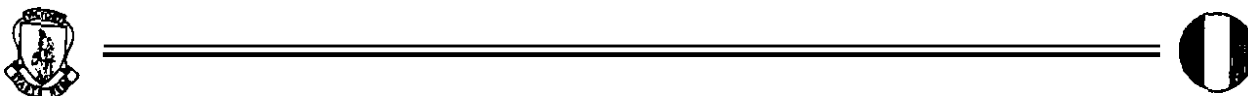
Posts are to be set a minimum of two feet into the ground with rails facing vehicular traffic areas.



Wooden guardrail



Metal guardrail



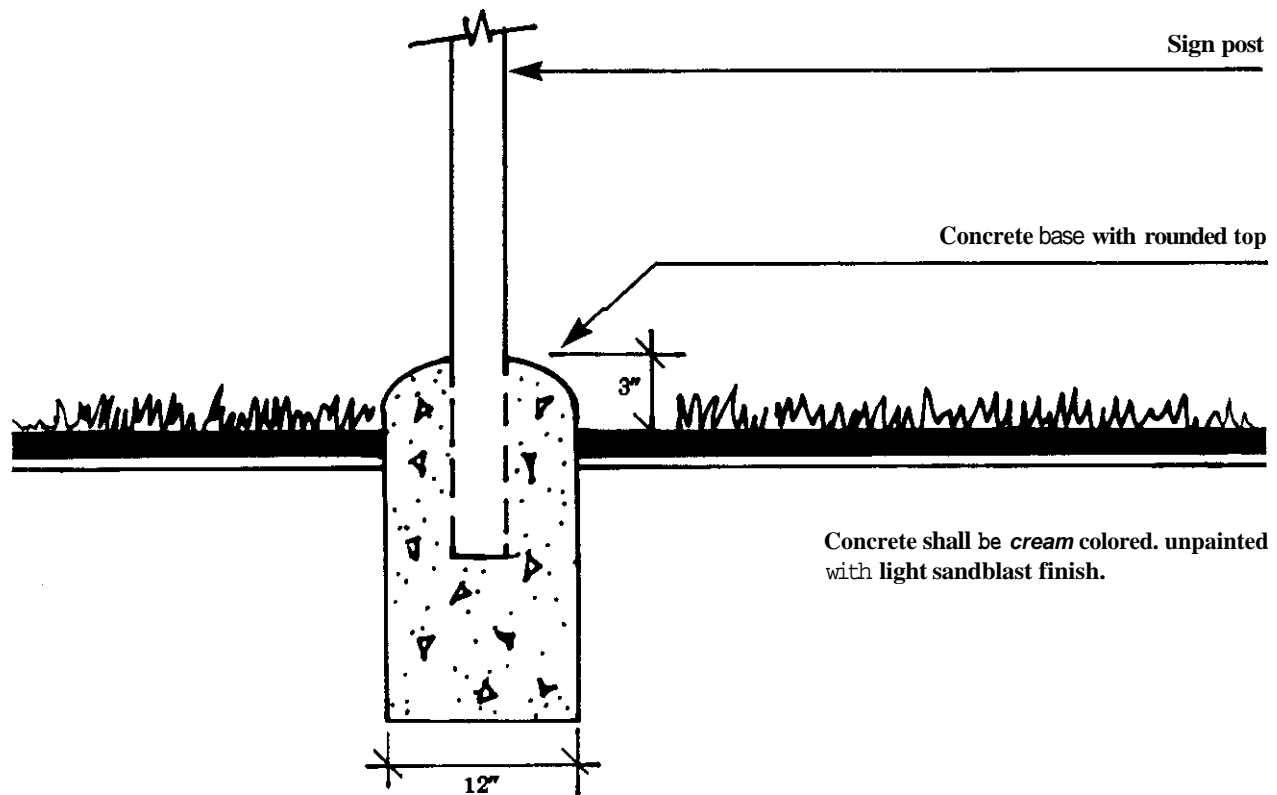
## SITE FURNISHINGS

### SIGN POST BASE

#### Sign Post Base

All sign posts are to be set into concrete bases that are a minimum of 12" in diameter. Setting depth shall be determined by the size of the sign in question but is to be a minimum of two feet.

All signs are to be located in landscaped beds wherever possible to minimize trimming requirements and the concrete base is to be raised three inches above grade.



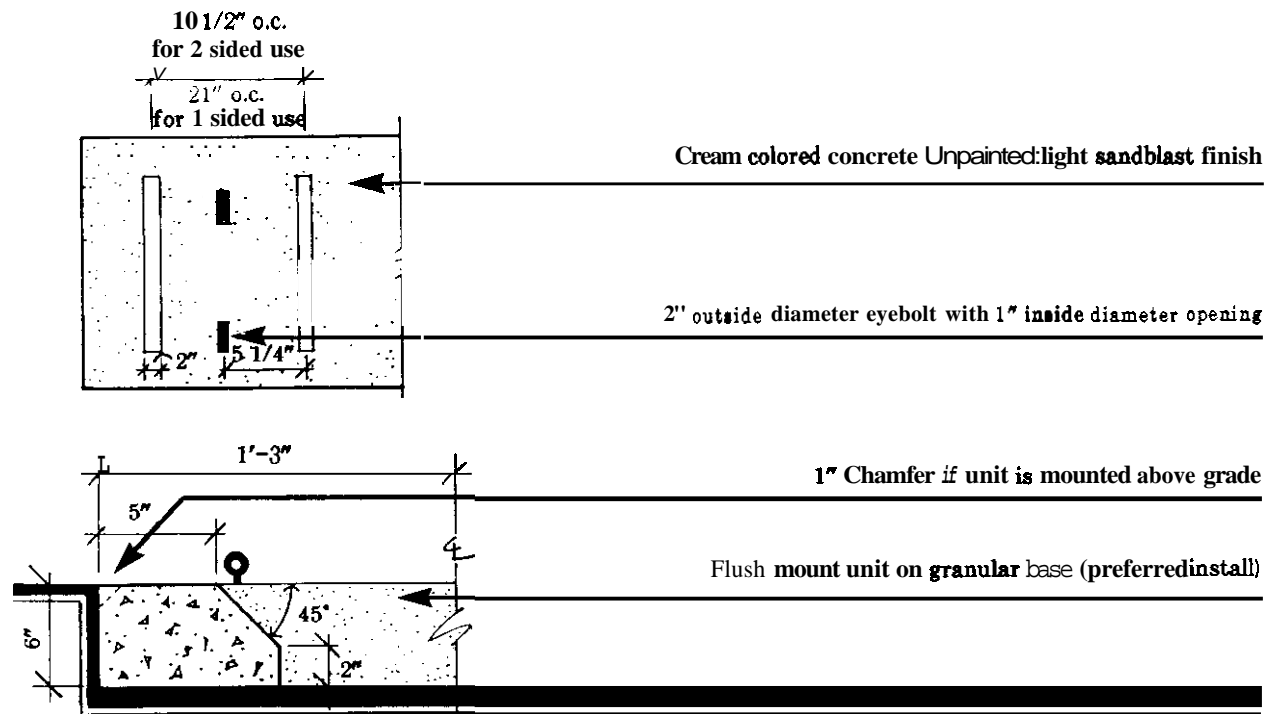
## SITE FURNISHINGS

### BICYCLE RACKS

#### Bicycle Racks

Bicycle storage areas are to be located near building and use area entrances. Leave adequate space for pedestrian circulation.

All such storage areas are to be in view of nearby street or adjacent buildings for security reasons.



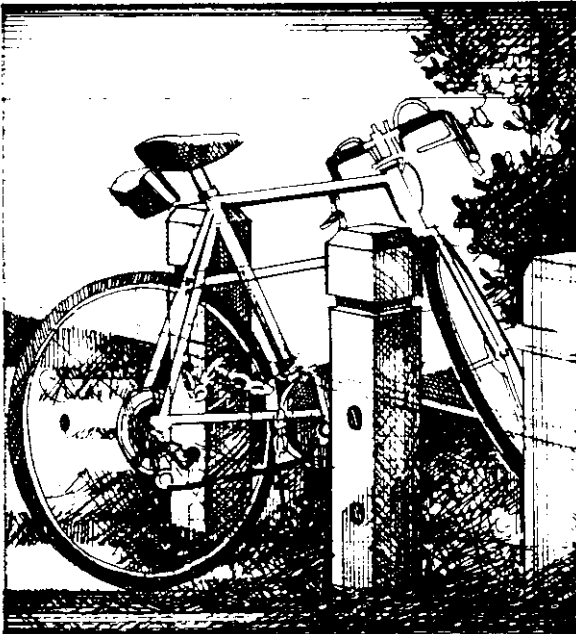
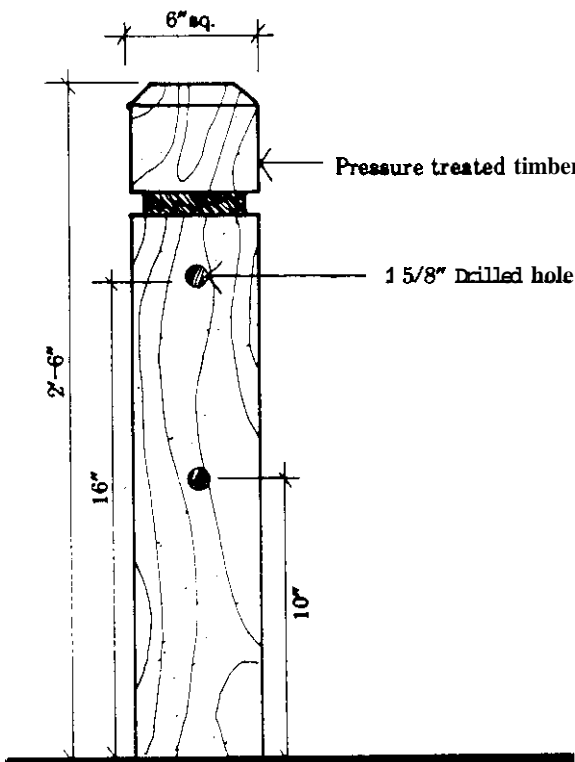
Concrete bicycle rack





SITE FURNISHINGS

BICYCLE RACKS



Wooden bicycle rack



## SITE FURNISHINGS

### DUMPSTER ENCLOSURES

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#### Design Criteria

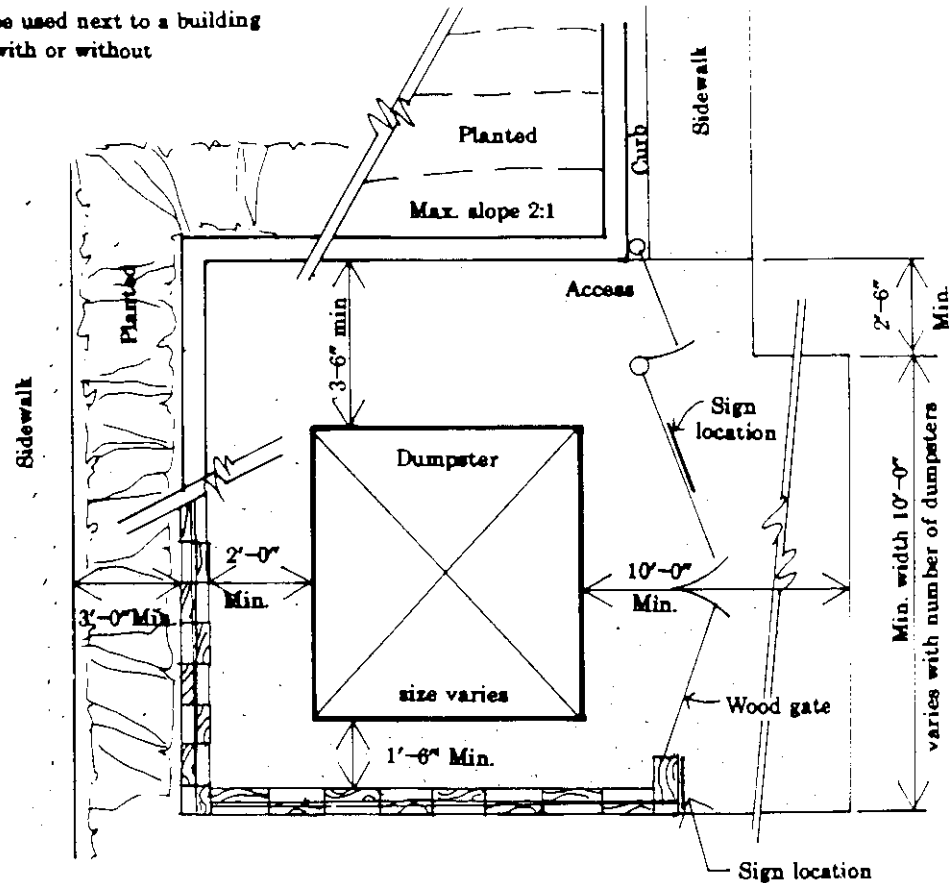
- Dumpsters are to be conveniently located near the facility that they serve, near side or rear entries, and away from walkways and main roads.
- There is to be adequate maneuvering room to allow access and service by garbage trucks.
- All dumpsters are to be placed on concrete pads adequate to support the weight and front wheels of the service vehicle.
- Adequate overhead clearance is to be provided, away from overhead wires, building eaves and trees branches.
- Dumpsters are not to be placed near bedroom or classroom windows.
- Dumpsters and group storage of garbage cans are to be concealed on a minimum of three sides by the use of walls, fencing, earthberms, landscape planting or a combination of these items.
- All bulk refuse containers or compactors are to be located in rear service areas near loading docks and screened from view.
- Dumpsters are to be clean galvanized metal etched and painted dark brown, #30099.
- Dumpsters are to be cleaned and repainted regularly, approximately every **six** months.
- A water source or hose bib is to be located within 100 feet of all dumpsters for cleaning purposes.
- If possible, dumpster enclosures are to be incorporated into the architecture of a structure, preferably near the service area or grouped with mechanical equipment off to a rarely seen side of the building.
- Enclosure materials **are** to relate to surrounding buildings and are not to interfere with the facades of important or historical buildings.



## SITE FURNISHINGS

### DUMPSTER ENCLOSURES

Masonry Wall: to be used next to a building or other structure, with or without planted earth berm



Wood fence: to be used where dumpster is near another structure

#### Dumpster enclosure plan

If a dumpster cannot be located near a building so that the enclosure becomes a part of the building facade or if the only accessible location is in or near a parking lot, the following principles will apply:

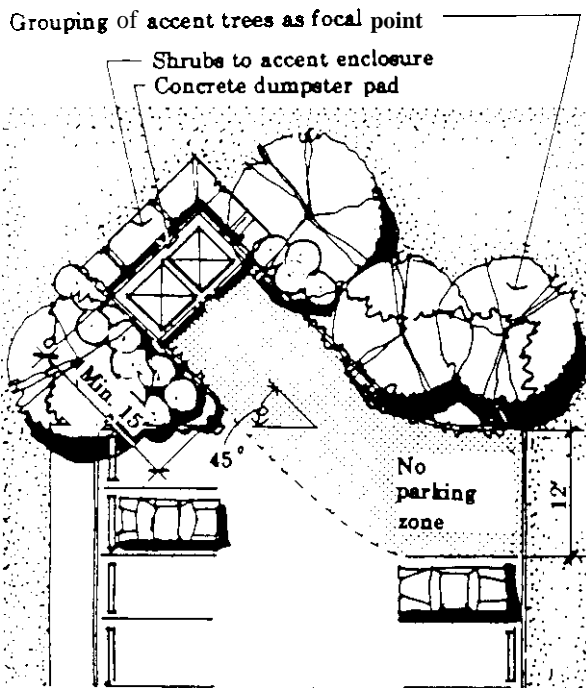
- o Dumpsters are to be located a maximum of 300 feet from building entries.
- A planted buffer zone a minimum of 4 feet in width, of evergreen plant material shall surround the dumpster enclosure on three sides and effectively separate the enclosure from pedestrian walkways.
- Dumpsters are not to be located on, or adjacent to, pedestrian walks or near playgrounds.



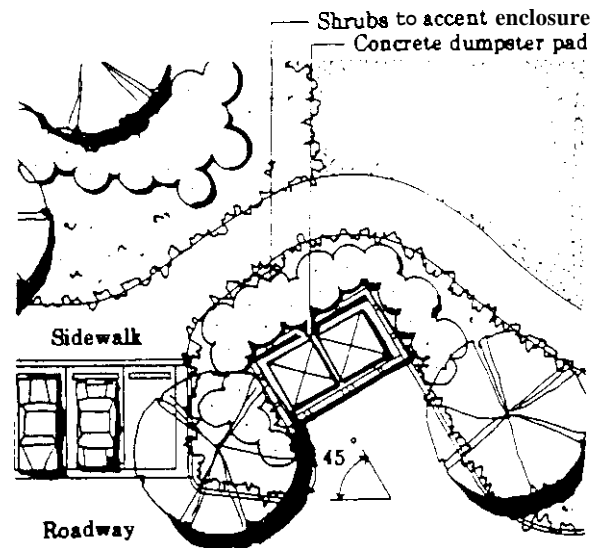
## SITE FURNISHINGS

### DUMPSTER ENCLOSURES

- o Dumpsters are to be located on concrete pads set a minimum of 15 feet from back of curb at a 45 degree angle.
- Where dumpsters are located at the terminus of a parking lot, an area required for truck maneuvering shall be striped and labeled “No Parking Zone”.
- o Dumpsters shall have a double gate on the front side of the enclosure with a childproof latch. Gates are to be kept closed at all times.
- o In housing or other areas where individuals must use the dumpster on a regular basis, a paved walkway shall lead to the dumpster enclosure an easily accessible pedestrian gate shall be provided to the enclosure which corresponds to the dumpster opening.



Typical dumpster location at end of parking lot



Typical dumpster location near on-street parking

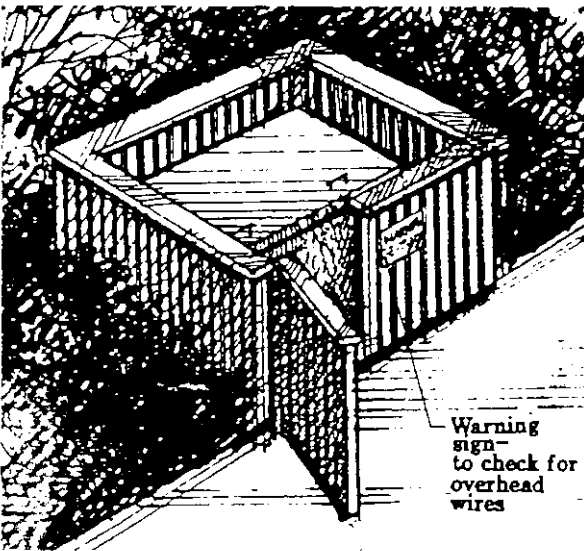


SITE FURNISHINGS

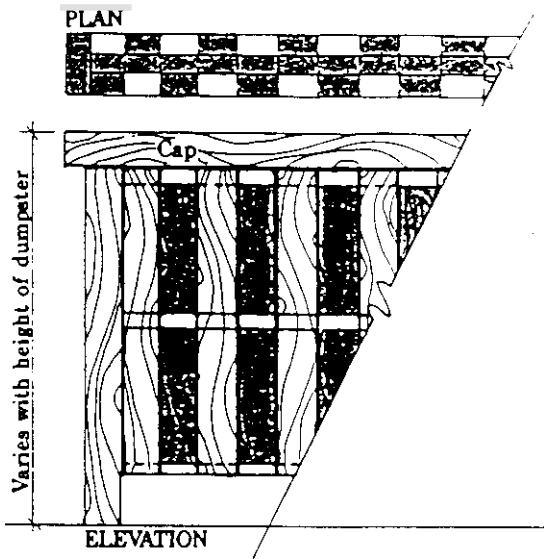
DUMPSTER ENCLOSURES

Wood Dumpster Enclosure

Wood dumpster enclosures are to be used for all dumpsters that are either not immediately adjacent to buildings or other structures, or are next to an all wood structure. If next to an all wood structure, the enclosure is to be painted to match the building color. Otherwise, the wood enclosure is to be painted dark brown #30099. The area around a wood dumpster enclosure is to be planted in order to blend it into the adjacent landscape and lessen the impact of the structure. Plants can also filter odors that are common around dumpsters. The wood dumpster enclosure is to be used throughout Fort Jackson.



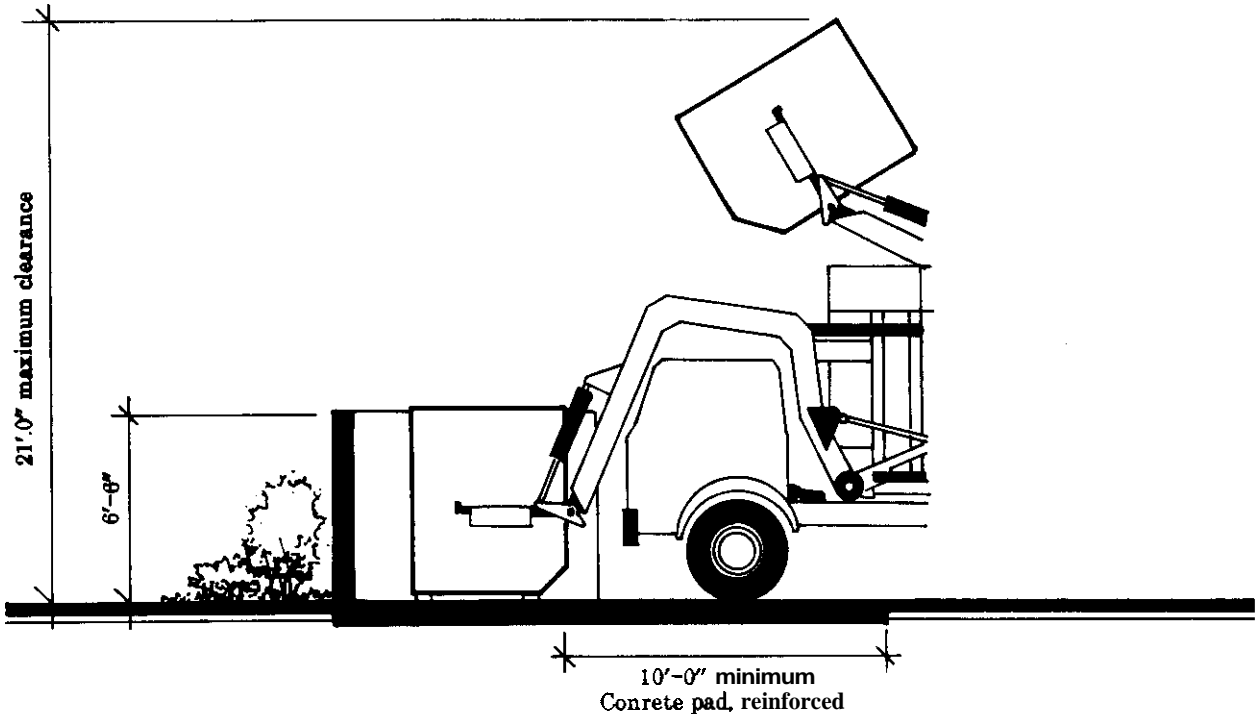
Wood dumpster enclosure



Detail of wood dumpster enclosure



**SITE FURNISHINGS**  
**DUMPSTER ENCLOSURES**



Concrete pad



SITE FURNISHINGS

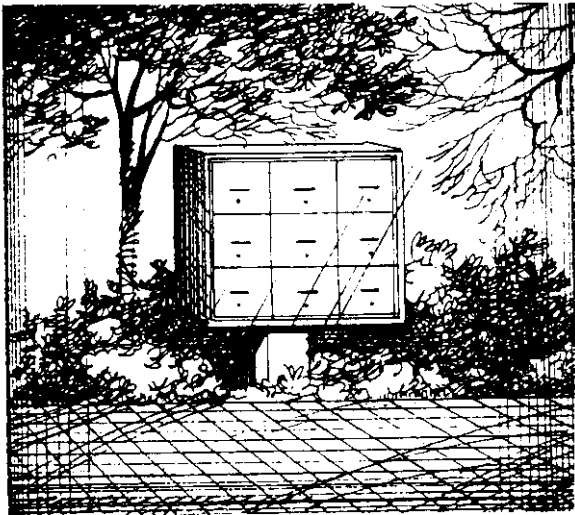
MAILBOXES

Mailboxes

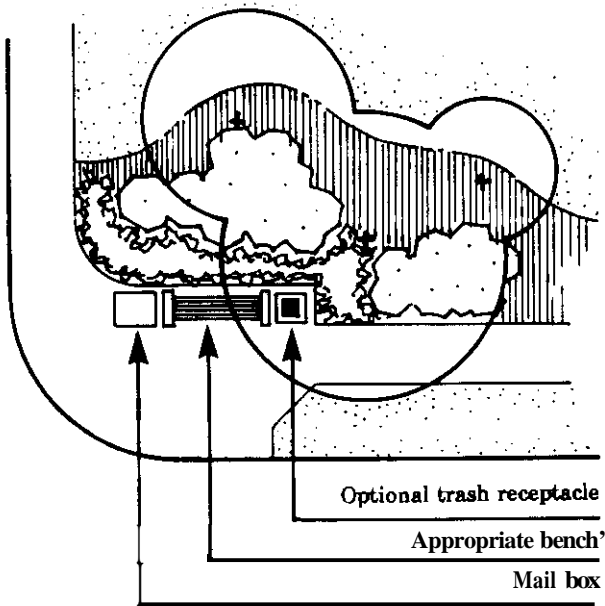
All mailboxes are to be located near the front door(s) of the unit(s) they serve along the line of travel from parking areas to the most used building entrances. Types of boxes used must be approved by the U.S. Postmaster General.

When required, ‘Group’ or ‘Gang’ mailboxes shall be placed in convenient central locations and with other site furnishings such as bus stops, bulletin boards, benches and trash receptacles. Approved types of group mailboxes shall be bronze anodized aluminum or painted standard dark brown semi-gloss, 20059, Federal Standard 595-A, or 476. Pantone Matching System, enamel and clearly marked ‘Mail’ or ‘United States Mail’. All such groupings of site furnishings are to be on paved surfaces adjacent to but not encroaching upon sidewalks. These groupings will be heavily landscaped.

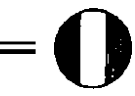
All materials are to be compatible with that of surrounding buildings and materials.



Group mailbox



Plan



## SITE FURNISHINGS

### PLAYGROUNDS

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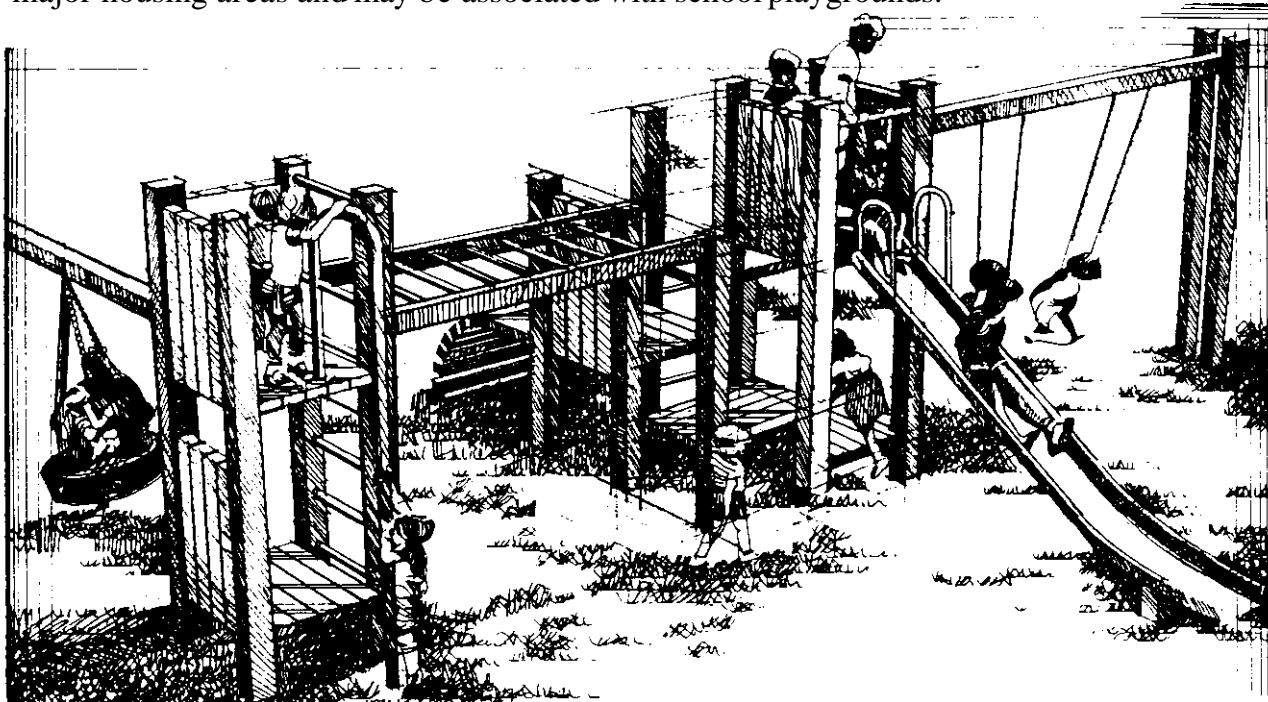
#### Playgrounds

Small playground areas are to be provided within 600 feet of each housing unit. They should be easily accessible. Children are not to cross a secondary collector road at grade to reach a lot. Walks are to be paved and have low gradients. Each lot should be from 1000 to 2000 square feet in size and serve from 50 to 100 families.

All playgrounds should be located within view of several nearby residences, be partially shaded, have an enclosed play area secured from pets, and provide seating nearby for parents to supervise play. A soft play surface such as sand, pea gravel, sawdust or wood chips is to be used and contained within the play area.

Play equipment is to be of dimensional treated timber of traditional design such as swings, seesaws and slides, and of designs for child **skills** development such as balance beams, climbers, playhouses and slidepoles. A water fountain is to be available at each playground facility.

Larger playgrounds and recreation fields are to be located in single family housing or between major housing areas and may be associated with school playgrounds.

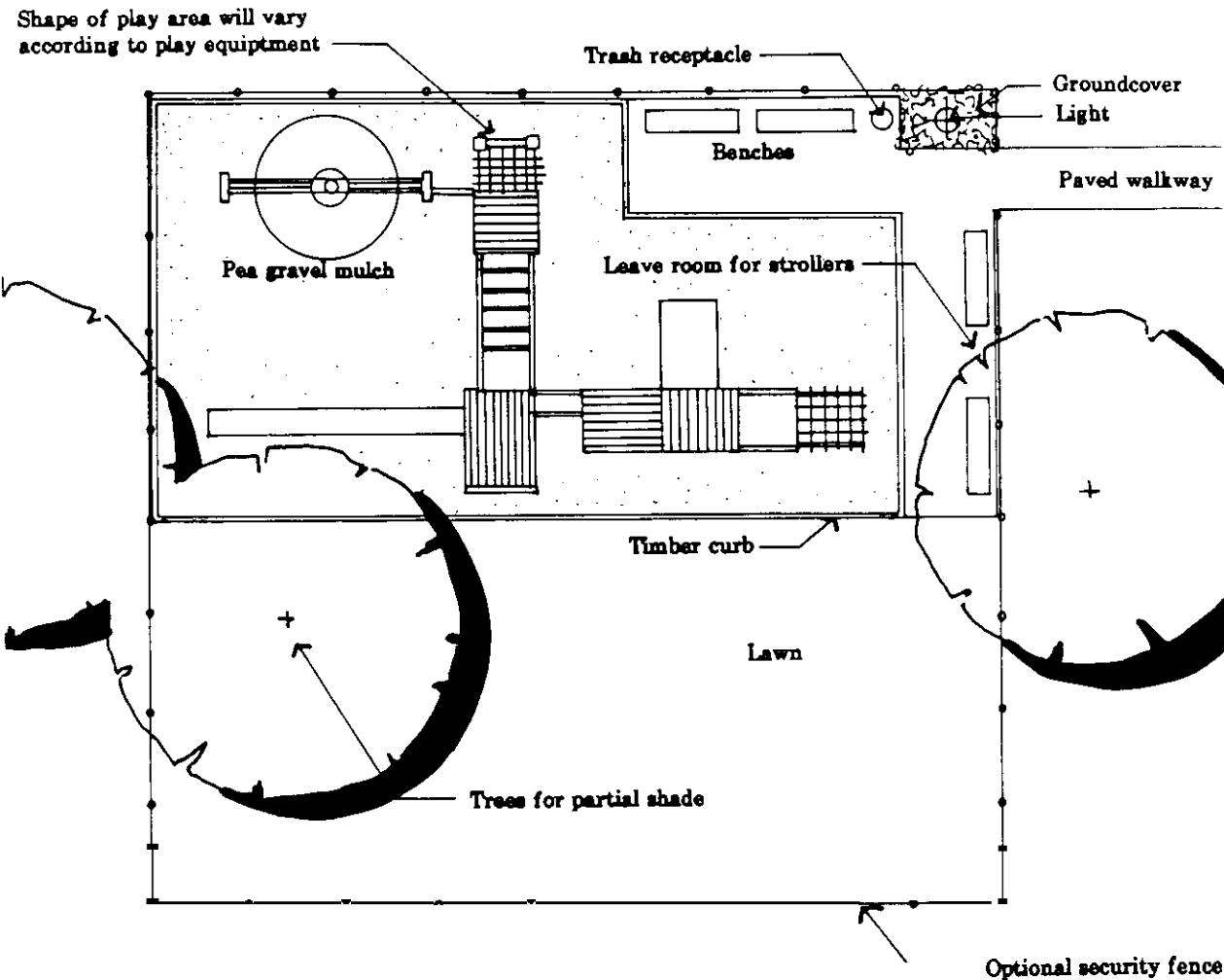


Dimensional timber play equipment





SITE FURNISHINGS  
PLAYGROUNDS



Typical playground



# SITE FURNISHINGS

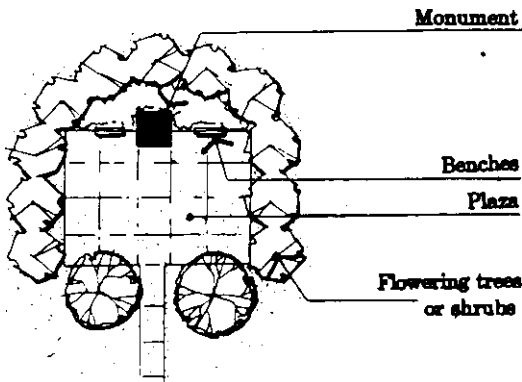
## MONUMENTS AND PLAQUES

### Monuments and Plaques

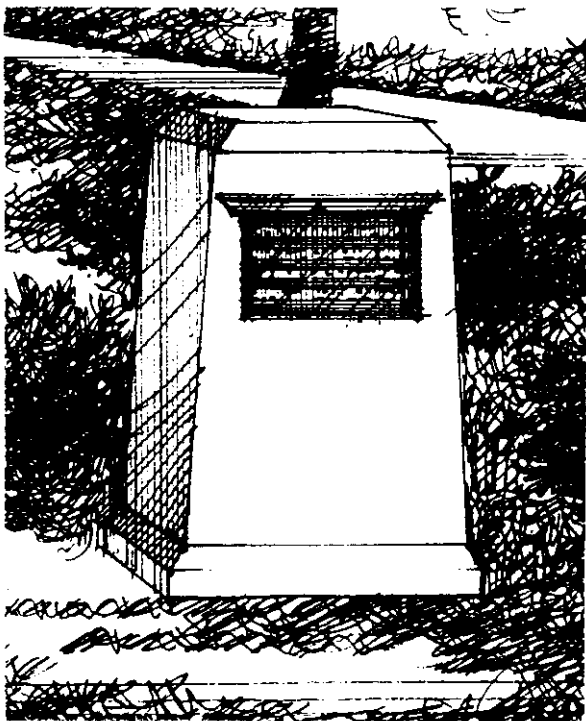
Monuments can either be sculptural works of art, or displays of technical or military hardware. They are to be displayed at points of entry or high visibility focal points. Interpretive information is to be displayed on standard exhibit/information signs and dedication or memorial information is to be presented on bronze or brass plaques that are mounted on the base of the actual monument, in the pavement in front of the monument, or on an appropriately sized stone stand placed near the monument.

Monuments are to be sited in plaza areas or at focal points along drives and walks. Hardware displays and other monuments generally should be grouped into central plazas or courtyards except when they mark the entry to significant buildings, mark historic sites, or are at a major focal point.

Monument areas are to display hardware in natural field situations if viewed from vehicles and are to be on minimum concrete pads for weed control and maintenance. They are to be paved on all sides if viewed by pedestrians, with an appropriate material such as brick, stone sets or pavers to match materials in adjacent buildings.



Typical monument in a plaza



Commemorative marker



## SITE FURNISHINGS

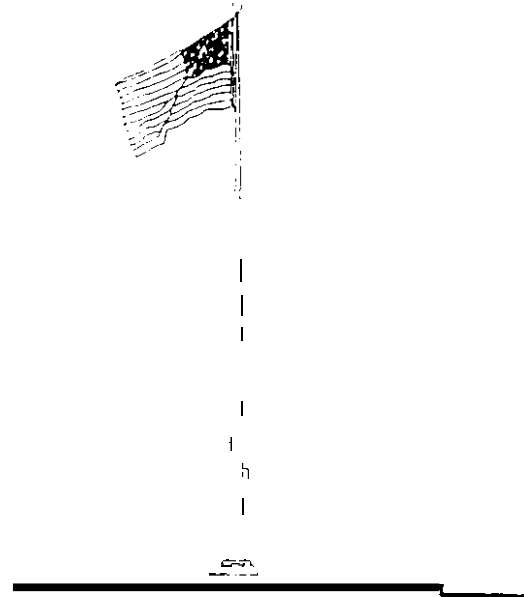
### FLAGPOLES

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#### Flagpoles

Flagpoles are to be used at Administration, Postal, Headquarters, School, Library, and other major community facilities buildings. They shall be of fixed metal construction and shall be painted or baked enamel white. A brass finial is optional.

Flagpoles are to be located in prominent locations near the front of principal entries to each building, preferably in a paved or plaza area. All such poles shall have a paved access path and base station for use by facility personnel or color guard units in raising and lowering ceremonies.



**Typical flagpole**

All flagpole installations not located in a paved area shall be heavily landscaped to provide a proper base. The approach walk to each flagpole shall also be landscaped.

Flagpoles at major Post ceremonial areas should be grouped to create a visual point of focus.

The use of sleeved or tipping poles for ease of removal or maintenance purposes is permitted.

Note: Refer to OCE Standard Drawing 38-05-03, for additional information.



## SITE FURNISHINGS

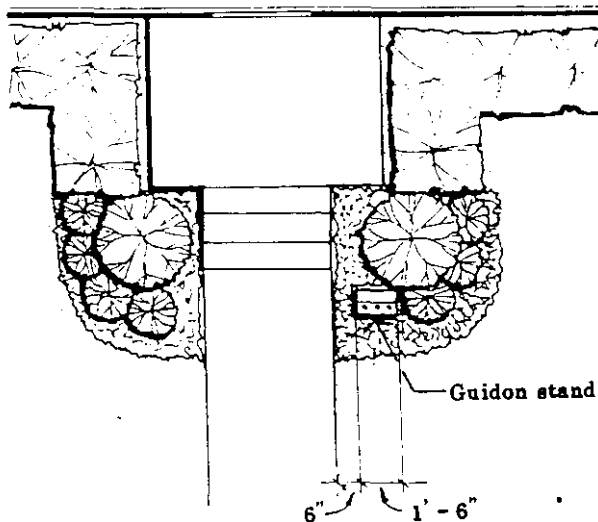
### GUIDON STANDS

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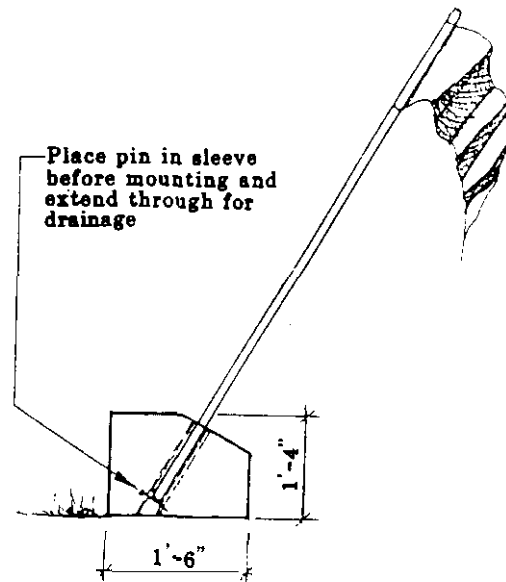
#### Guidon Stands

Guidon stands shall consist of a rough textured cream colored concrete with 1-1/2" i.d. galvanized pipe imbedded flush with the top surface. Existing concrete stands shall be painted a similar color.

Stands are to be located to the right of walks entering barracks/H.Q. buildings, on-grade at the foot of any stoop or stair leading into that building. Each stand shall have a minimum of 3 sleeves, and the guidon shall project forward from the building at a sixty degree angle.



Location of guidon



Elevation of guidon



# **SIGNAGE**

## **GENERAL INFORMATION**

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### **General Information**

The following series of signs and specifications has been developed specifically taken from TM5-807-10, Signage, H.Q.D.A. December 1983, and from the recently developed TRADOC Regulation No. 420-14, Facilities Engineering. Exterior Sign Standards. Several of the signs shown in the following system have been designed for this Post, are not shown in either of the sources listed, and are unique to this installation. Several other signs in this system are to replace signs shown in either or in both sources, such as the sign for naming streets.

The system of signs shown in this design guide shall take precedence over all other sources, technical manuals or regulations. This system is however, restricted to the typical basic signs normally needed on Post and there may be a need for a sign type or size that is not shown in this guide. When such a case occurs, or when the design, construction, or placement information presented herein is not sufficient, additional information is to be taken first, from TRADOC Regulation No. 420-14 and second from TM5-807-10

### **Colors and Materials**

All colors to be used are taken from standards developed by the Federal Administration, and include the equivalent Federal Standard 595a number as well as the Pantone Matching System number, which can be found in the Appendix in the Color Index. All signs shall be standard white vinyl die-cut letters on standard brown baked enamel aluminum posts, unless otherwise noted. Alkyd, epoxy or urethane enamels may be used. Reflective or vinyl sheeting and reflective graphics on reflective sheeting may be used when approved by the D.E.H. Steel, polycarbonate or exterior plywood sign panels and steel or wood sign posts may be used when approved by the D.E.H.

### **Traffic Symbols**

All traffic signs and symbols shall conform to those designated in the manual "Uniform Traffic Control Devices 1978 by the U.S. Department of Transportation/Federal Highway Administration.

### **Illumination**

All signs may be illuminated with non glare light sources that are not apparent in daylight hours such as indirect or below grade weather proof lights. Light shall be restricted to the sign panel only and shall be evenly distributed.



## SIGNAGE

### GENERAL INFORMATION

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**MASTER PLAN.** In order to assure that all installation signage communicates clearly in an efficient and systematic way, it is strongly recommended that an Installation or Small Area sign master plan be prepared. This plan should show the location and content of every proposed exterior identification, guide, mandatory/prohibitory, and informational sign on the Installation. The plan consists of two parts, the sign location plan and the sign schedule.

- A. Sign Location Plan. The sign location plan should be prepared using a current site plan of the Installation showing all structures and other major features. To prepare a sign location plan, determine the message content, sign type, and preliminary location of each required sign. Field verify the preliminary locations, and if necessary modify the locations to accommodate existing conditions. Assign and record a sequential number for each sign on the sign location plan.
- B. Sign Schedule. After preparation of the sign location plan, a sign schedule should be prepared indicating all signs required or proposed using the assigned location numbers.

The system is comprised of a logical progression of sign types which guide travel to activities or facilities through orientation to major routes within the Installation and identification of each destination. The basic sequence consists of

- o Identification of the Installation.
- Notification of security enforced on the Installation.
- o Identification of the major units stationed at the Installation.
- o Orientation to the site.
- Direction to destinations via street names and addresses.
- o Identification of destinations.

This progression of signs is supplemented as required with informational, motivational, and mandatory/prohibitory signage. Consistent and widely understood nomenclature must be used on all signs to avoid confusion. Colors to be used are to be standard brown (30099) for sign boards with white (27875) die-cut reflective letters except where otherwise noted.

**EMBLEMS** Standard colors for Army signage are listed in tables 2-1 and 2-2. Colors for military emblems must be in accordance with The Institute of Heraldry, U.S. Army, HQDA (DAAG-HDZ-A), Cameron Station, 5010 Duke Street, Alexandria, Virginia 22314, whose specifications utilize colors from the Standard color card of America, the Color Association of the United States, Inc. Branch colors are listed in table 2-1 in accordance with AR 670-1. Standard colors developed for the Federal Highway Administration are utilized on guide and mandatory/prohibitory signs. Colors for safety are in accordance with AR-385-30. Paints, inks, and reflective sheeting materials used in the production of signs must match the standard colors.



# SIGNAGE

## GENERAL INFORMATION

Table 2-1 Branch Colors

<i>Branch</i>	<i>Color</i>	<i>Cable Number</i>
Adjutant General Corps	Dark blue/scarlet	65012/65006
Air Defense Artillery	Scarlet	65006
Armor	Yellow	65002
Army Medical Specialist Corps	Maroodwhite	65017/65005
Army Nurse Corps	Maroodwhite	65017/65005
Branch Immaterial	Teal blue/white	70147165005
Cavalry	Yellow	65002
Chaplains	Black	65018
Chemical Corps	Cobalt blue/golden yellow	65011/65001
Civil Affairs, USAR	Purple/white	65009/65005
Corps of Engineers	Scarlet/white	65006/65006
Dental Corps	Maroodwhite	65017/65005
Field Artillery	Scarlet	65006
Finance Corps	Silver gray/golden yellow	65008/65001
General Staff	No color assigned	
Infantry	Light blue	65014
Inspector General	Dark blue/light blue	65012/65014
Judge Advocate General	Dark blue/white	65012/65005
Medical Corps	Maroon/white	65017/65005
Military Intelligence	Oriental blue/silver gray	70209/65008
Military Police Corps	Green/yellow	65007/65002
National Guard Bureau	Dark blue	65012
Ordnance Corps	Crimson/yellow	65013/65002
Quartermaster Corps	Buff	65015
Signal Corps	Orange/white	65004/65005
Staff Specialist, USAR	Green	65007
<b>Sgt. Maj. of the US Army</b>	No color assigned	
Transportation Corps	Brick red/golden yellow	65020/65001
Veterinary Corps	Maroodwhite	65017/65005
Warrant Officers	Brown	65016



## SIGNAGE

### GENERAL INFORMATION

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#### Table 2-2 Standard Colors

##### **Standard Brown**

###### Reflective Sheeting:

Federal Highway Administration, PR Color #5, Highway Brown

###### Paint:

ISCC-NBS, Color Designation 56 Strong Brown, Federal Standard 595a, Color #30099 (luster less), National Park Service Brown

###### Ink:

PMS 469

##### **Standard White**

###### Reflective Sheeting:

Federal Highway Administration, White or Silver White

###### Paint:

Federal Standard 595a, Color #17875 (gloss), Color #27875 (semi gloss)

###### Ink:

PMS White

##### **Standard Red**

###### Reflective sheeting:

Federal Highway Administration, PR Color #

###### Paint:

Federal Standard 595a, Color #11105 (gloss), Color #21105 (semi gloss)

###### Ink:

PMS 187



## SIGNAGE

### GENERAL INFORMATION

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Standard Blue

Reflective Sheeting:

Federal Highway Administration, PR Color #3, Highway Blue

Paint:

Federal Standard 595a, Color #15090 (Gloss)

Ink:

PMS 294

Standard Black

Non-reflective Sheeting:

Black

Paint:

Federal Standard 595a, Color # 17038 (gloss), Color #27038 (semi-gloss)

Ink:

PMS Process Black

Standard Green

Reflective sheeting:

Federal Highway Administration, PR Color #4, Highway Green

Paint:

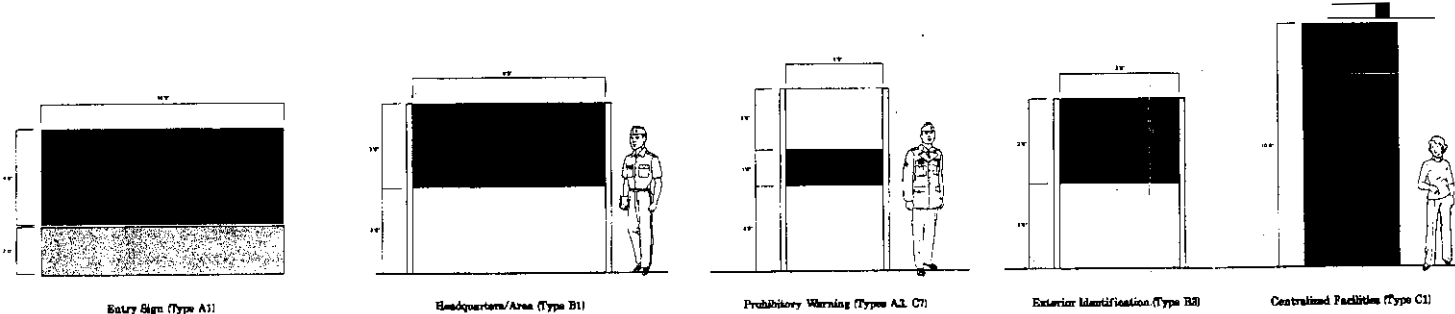
Federal Standard 595a, Color #14109 (gloss), color #24108 (semi-gloss)

Ink:

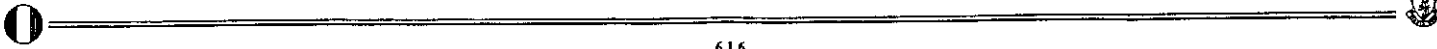
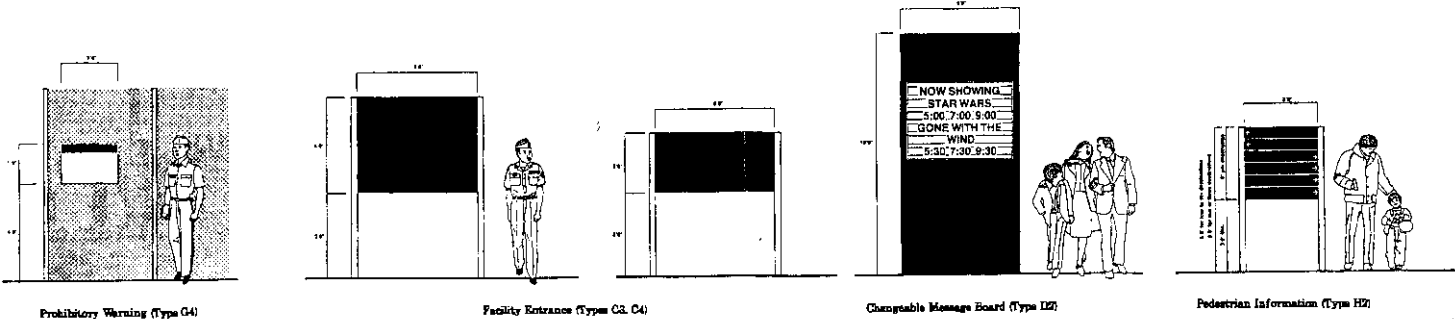
PMS 342



SIGN TYPES



Sign types given refer to designations in Technical Manual TM 8-807-10



## SIGNAGE TYPEFACE/SYMBOLS

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### Typography

Two typefaces are used in the signage system: helvetica medium and helvetica regular (with the exception of traffic control signs which follow guidelines in Standard Alphabets for Highway Signs and Pavement Markings published by the Federal Highway Administration). Since typefaces are not completely standardized in the printing and signage industries, any typeface being considered must be visually matched with examples shown:

- A. Helvetica Medium. Helvetica medium, is the primary system typeface and is used for major information on all signs.

**ABCDEFGHIJKLMNOPQRSTUVWXYZ**

**it cdefgl rstuvwxyz  
1234567890\$¢%/ (&.,:;“”!?.-\*)**

- B. Helvetica Regular. Helvetica regular, is used for secondary information on signs and for translations of foreign languages using roman characters. Helvetica regular is never used in a situation requiring arrows.

**ABCDEFGHIJKLMNOPQRSTUVWXYZ**

**abcdefghijklmnopqrstuvwxyz  
1234567890\$¢%/ (&.,:;“”!?.-\*)**



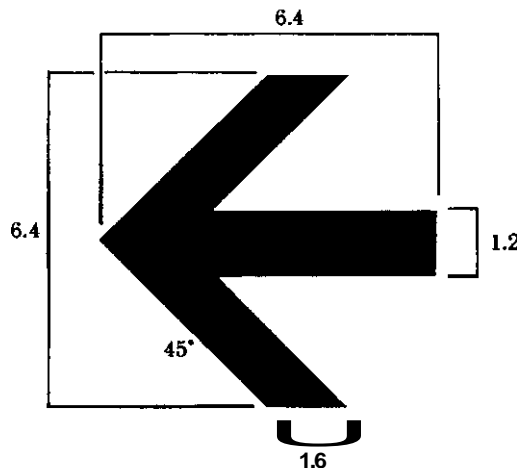
## SIGNAGE

### TYPEFACE/SYMBOLS

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- C. **Letter Spacing.** Application of letters should be proportionately spaced to maintain visually equal spacing and alignment. Mechanically equal spacing will not be used.
1. **Letter Spacing Standards.** Letter spacing standards should be followed for both helvetica medium and helvetica regular typefaces. These standards are based on a unit system. Each unit is equivalent to 1/50th of the capital letter height.
  2. **Tile system.** Adhesive-backed vinyl die-cut letters supplied on proportionately sized paperboard tiles are an alternative letter spacing method. These tiles are notched to assure vertical alignment. The tiles are placed next to each other, lining up the alignment notches with the grid lines drawn on the sign face. Tile systems allow installations personnel to prepare professional quality signs with minimal training. Since letters are available individually, any message can be prepared as required, provided that an inventory of character tiles is maintained.
  3. **Pre-spaced system.** Adhesive-backed vinyl die-cut letters, pre-spaced and aligned on a transparent carrier sheet, are another alternative letter spacing method. This allows installation personnel to prepare professional quality signs quickly with minimal training. No inventory is required; however, lead time *is* necessary for manufacturers to prepare ordered messages.
- D. **Standard arrows.** All guide and informational signage intended for pedestrian use, either exterior or interior, must use the arrow shown.

CAPITAL LETTER HEIGHT=5.0



## SIGNAGE

### TYPEFACE/SYMBOLS

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#### E. Layout guidelines.

1. Good judgement is the key to deciding where the lines should break in a sign message. Single ideas or names should appear on the same line, as follows:
  - a. Headquarters  
Fort McPherson
  - b. not,  
Headquarters Fort  
McPherson
2. Names should be spelled out in full whenever possible, unless otherwise specified in the authorized unit name, as follows:
  - a. 4th Infantry Division
  - b. 4th Battalion 61st ADA

**If abbreviations are required, they must be in accordance with AR 310-50.**
3. Numbers should be used for the titles of military units except corps, which are designated by Roman numerals, and armies, which are spelled out in accordance with AR 340-15, as follows:
  - a. Eighth US Army
  - b. 56th Artillery Brigade
4. Line breaks should be balanced, as follows:
  - a. Material Development  
and Readiness Command
  - b. Engineering Plans/  
Real Property
  - c. United States  
Post Office
  - d. Authorized
  - e. Training and Doctrine  
Command



## SIGNAGE

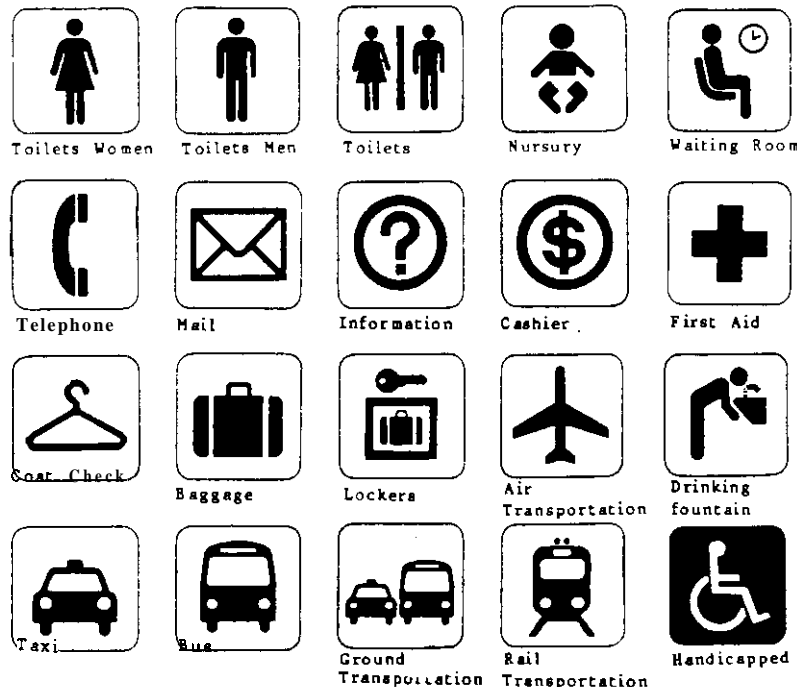
### TYPEFACE/SYMBOLS

#### Pictographs

In addition to standard symbols in the Manual on Uniform Traffic Control Devices, the symbols described here are for use on Army exterior and interior signs. The symbol background border must be square with rounded edges and the line weight of the border must be consistent for all symbols.

A. Service symbols. The service symbols shown were developed for the Department of Transportation (DOT) for use in transportation-related facilities. The pictograph should be black against a white background, with the following exceptions:

1. Accessibility for the handicapped. When used for traffic control, this symbol must follow standards in the Manual on Uniform Traffic Control Devices. Accessibility for the handicapped symbols should be used in accordance with DOD Manual 4270.1m Chapter 18, Dec. 15, 1983 with additional identification and directional signage as required. The symbol is composed of two elements: a white wheelchair figure (which should always face right) on a square background colored international (safety) blue (Federal Standard 595a, color #15180). In areas serving the visually handicapped, the symbol, letters and numbers should be raised or indented 1/16 inch with letters or numbers 2 to 3 inches in height.
2. First Aid. Red cross on a white background.

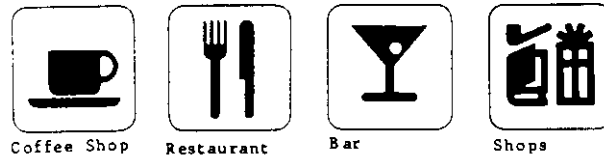


## SIGNAGE

### TYPEFACE/SYMBOLS

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- B. Concession symbols. The symbols for concession services are shown. The pictograph should be black on a white background.



- C. Mandatory/prohibitory symbols. Symbols for mandatory/prohibitory signage were developed to regulate safety instruction and pedestrian traffic. The symbols are not intended for traffic control, with the exception of “Parking” and “No Parking”. The pictograph color standards are as follows:

1. Fire Extinguisher. Red pictograph on a white background.
2. No entry. Red pictograph on a white background.
3. Smoking. Black pictograph on a white background.
4. No smoking. Black pictograph with red circle and slash overlay on a white background.
5. Parking. Green “P” on a white background.
6. Reserved parking. Black “P” on a white background.
7. No parking. Black “P” with red circle and slash on a white background.
8. No dogs. Black pictograph with red circle and slash overlay on a white background.

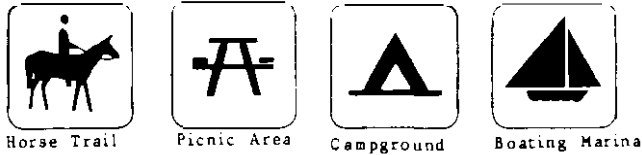


## SIGNAGE

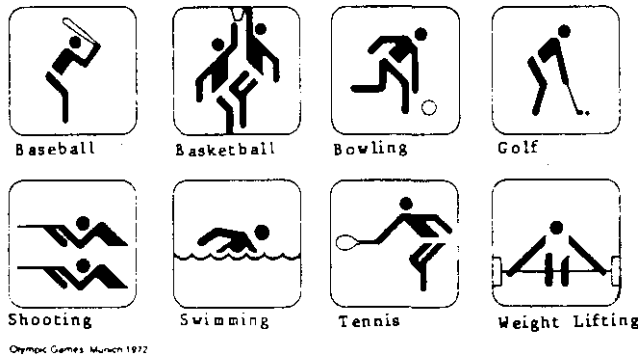
### TYPEFACE/SYMBOLS

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- D. Sports and recreation symbols. These symbols were developed for the National Park Service. The pictograph should be black on a white background.



- E. Olympic Games symbols. Sports symbols developed for the 1972 Olympic Games should be used for those activities not covered by the National Park Service symbols. The pictograph should be black on a white background.



### Military Emblems

- A. Department of the Army Plaque. The plaque is displayed on base identification signs to emphasize the heritage and professionalism of the United States Army. The design of the plaque must be in accordance with **AR 840-1**, and it must appear in full color.
- B. Unit Emblems. Military units may use their branch insignia, shoulder sleeve insignia, coats of arms, or distinctive unit insignia on their headquarters signs. In addition; insignias, coat of **arms**, and unit mottos may be used on motivational signs to symbolize the honor and prestige of a military unit. Military emblems must appear in full color.



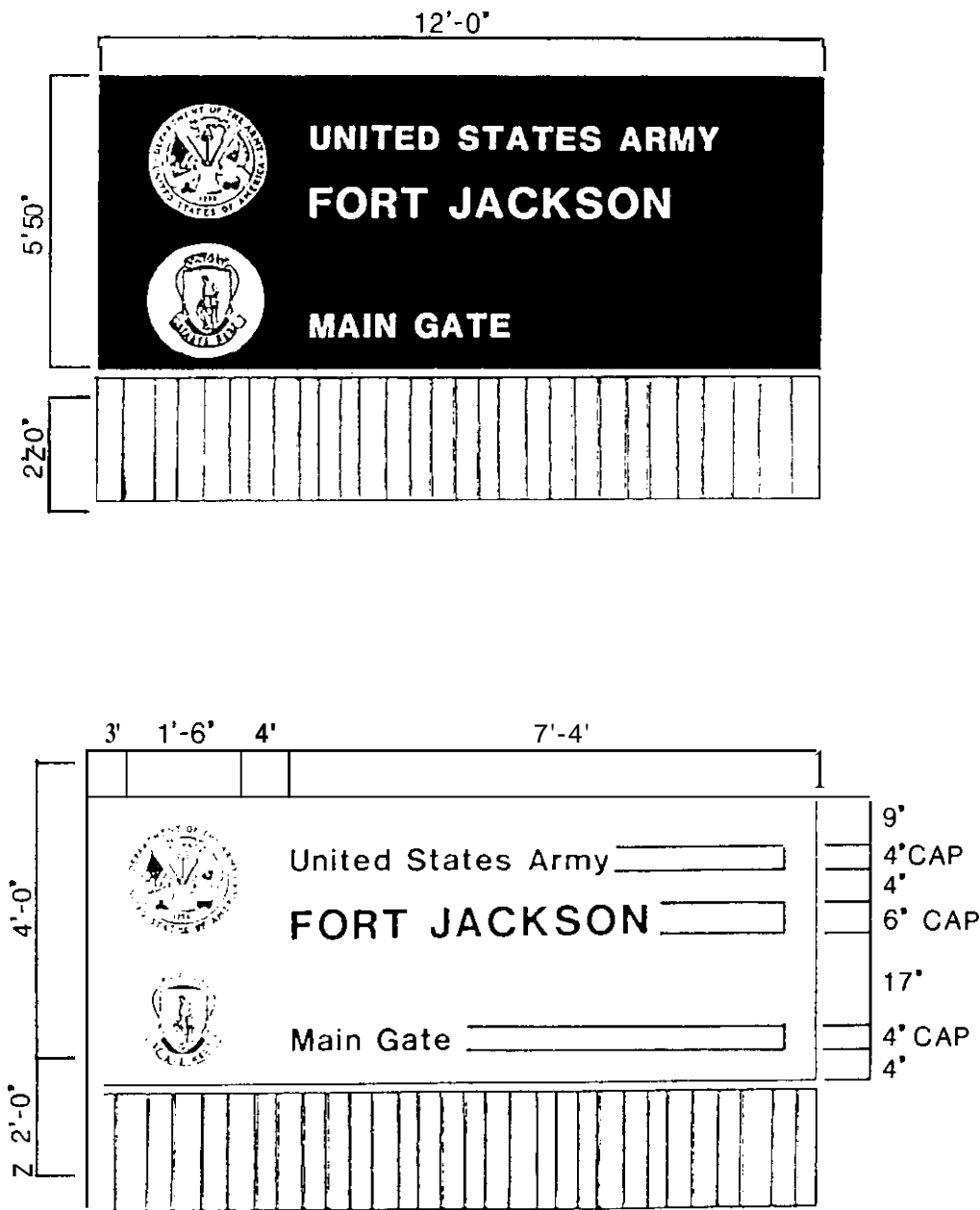


SIGNAGE

ENTRY SIGN

Entry Sign :Sign Type A1

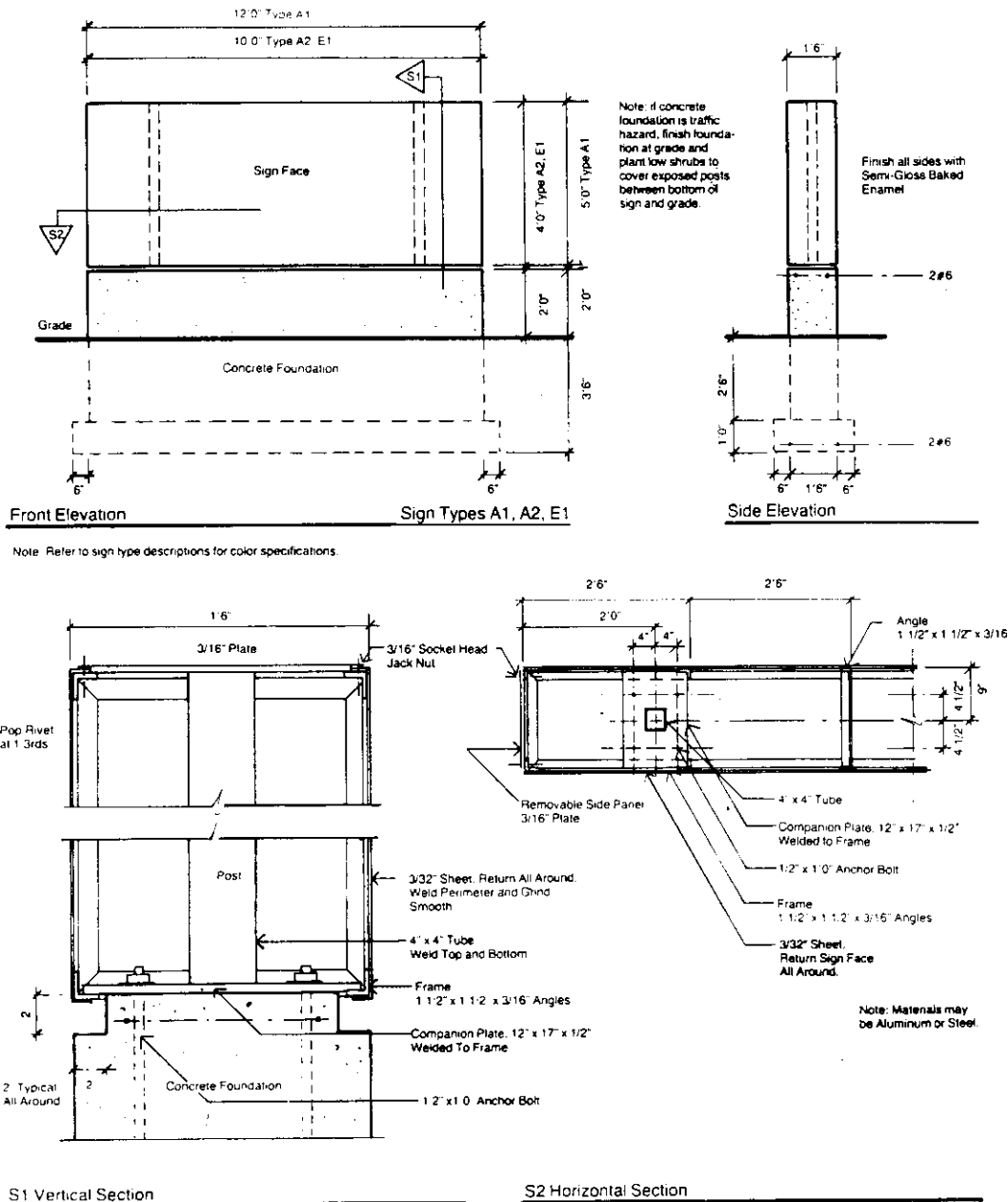
To be used at all major points of entry to Post, in Open Space Zone only.



# SIGNAGE

## ENTRY SIGN

Sign base to be Fed Std. **595-A** #33717, cream color is to be integrated into *mix* and poured into rough sawn board forms.



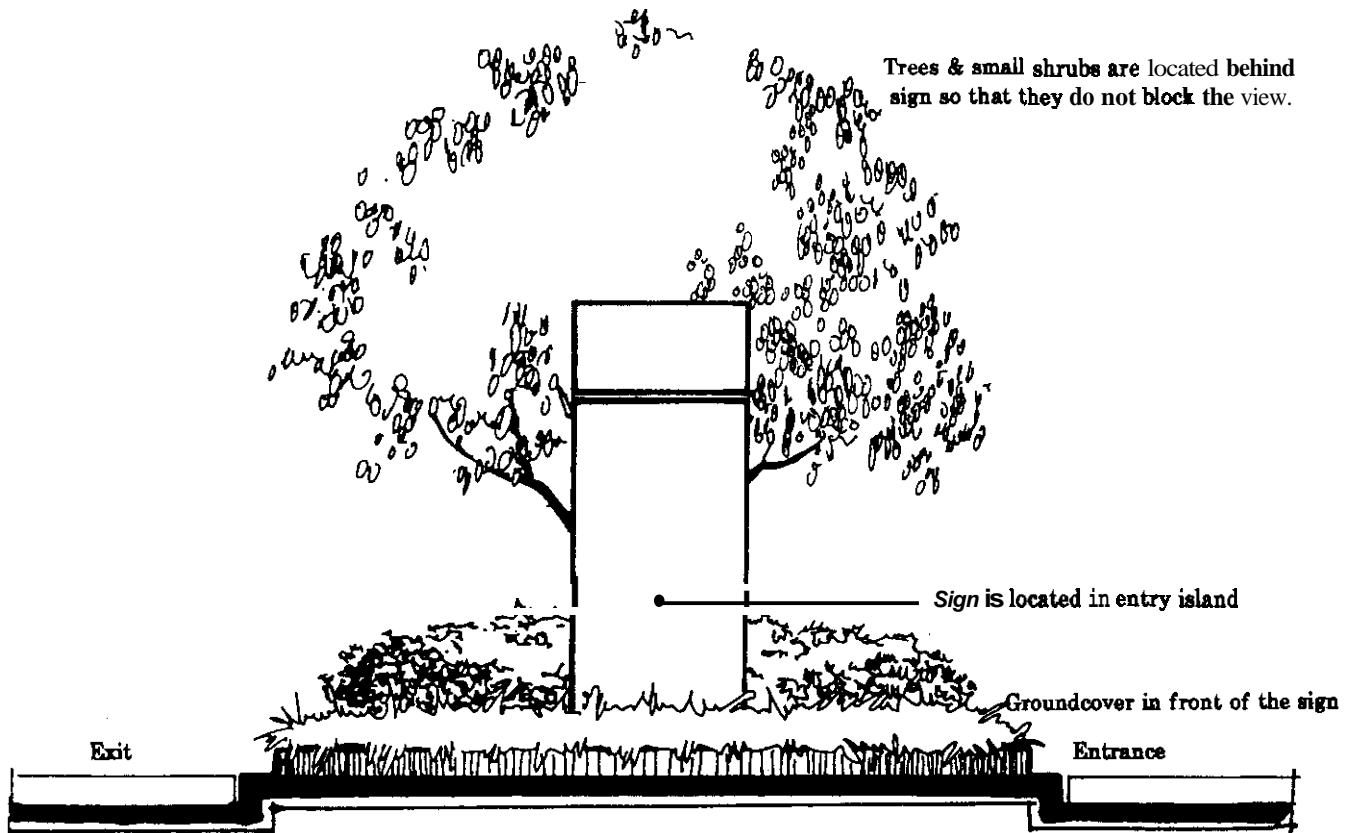
## SIGNAGE

### ENTRY SIGN

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#### Entry Sign: Sign Type C1

In those areas where a group of buildings are located in a complex, this sign is to be used at the major entry to identify the buildings within the complex.

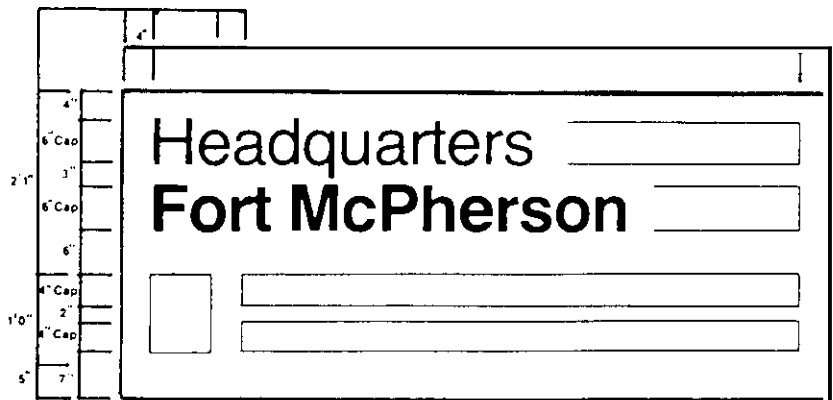
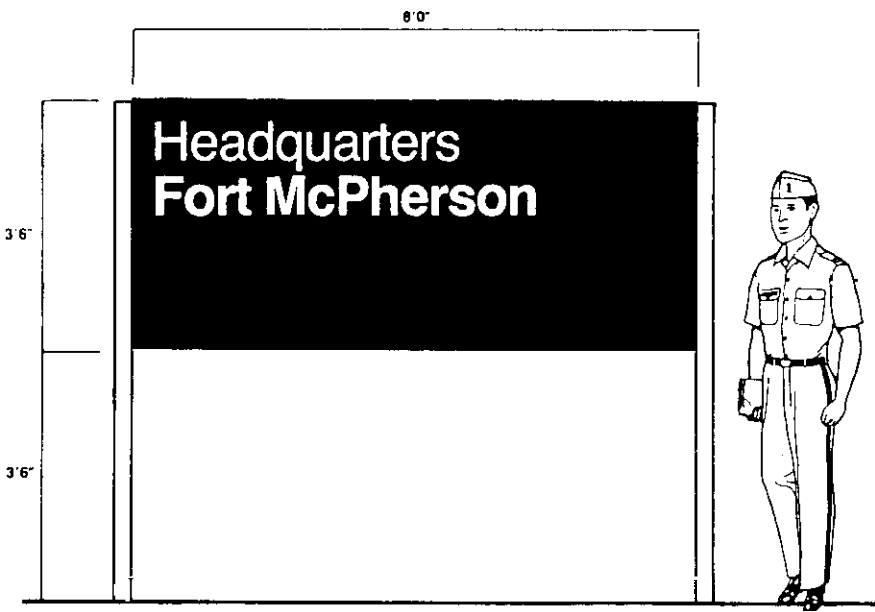


SIGNAGE

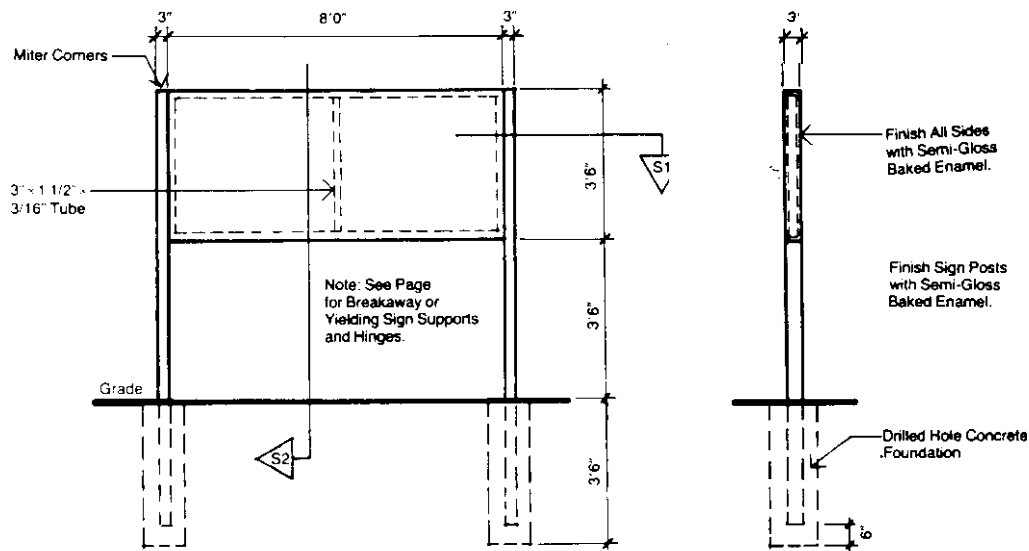
HEADQUARTERS/AREA

Headquarters/Area : *Sign Type B1*

To be used at: Installation Headquarters (command, division and brigade) headquarters, secondary Post entrances, and at points of graphic display. This sign will be at the entry to all housing areas, small areas and remote facilities attached to the Post, and in front of major community facilities. See sheet 6.4.4 for sign base information.



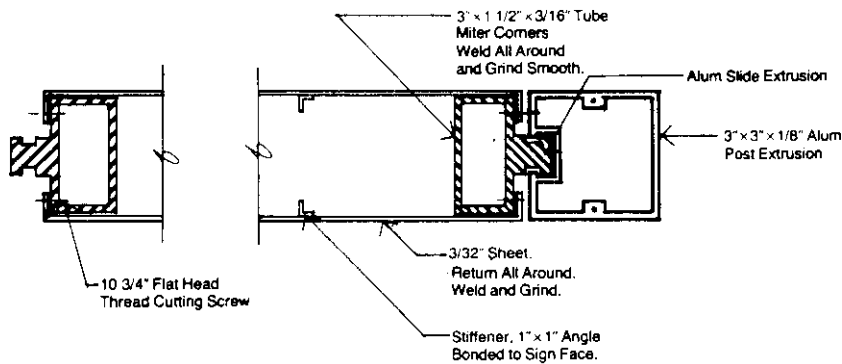
## SIGNAGE HEADQUARTERS/AREA



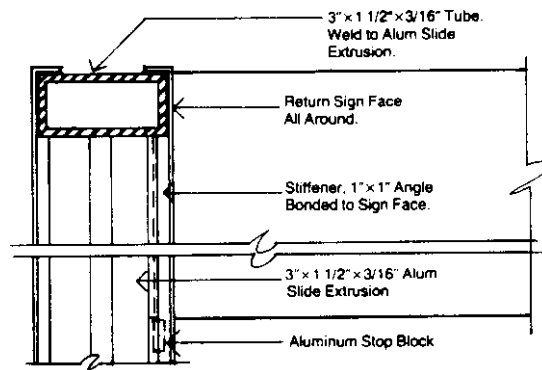
**Front Elevation Sign Type B1**

Note: Refer to sign type descriptions for color specifications.

**Side Elevation**



**S1 Horizontal Section**



**S2 Vertical Section**

Headquarters \_\_\_\_\_  
**Fort Monroe** \_\_\_\_\_  
 Training and Doctrine \_\_\_\_\_  
 Command \_\_\_\_\_

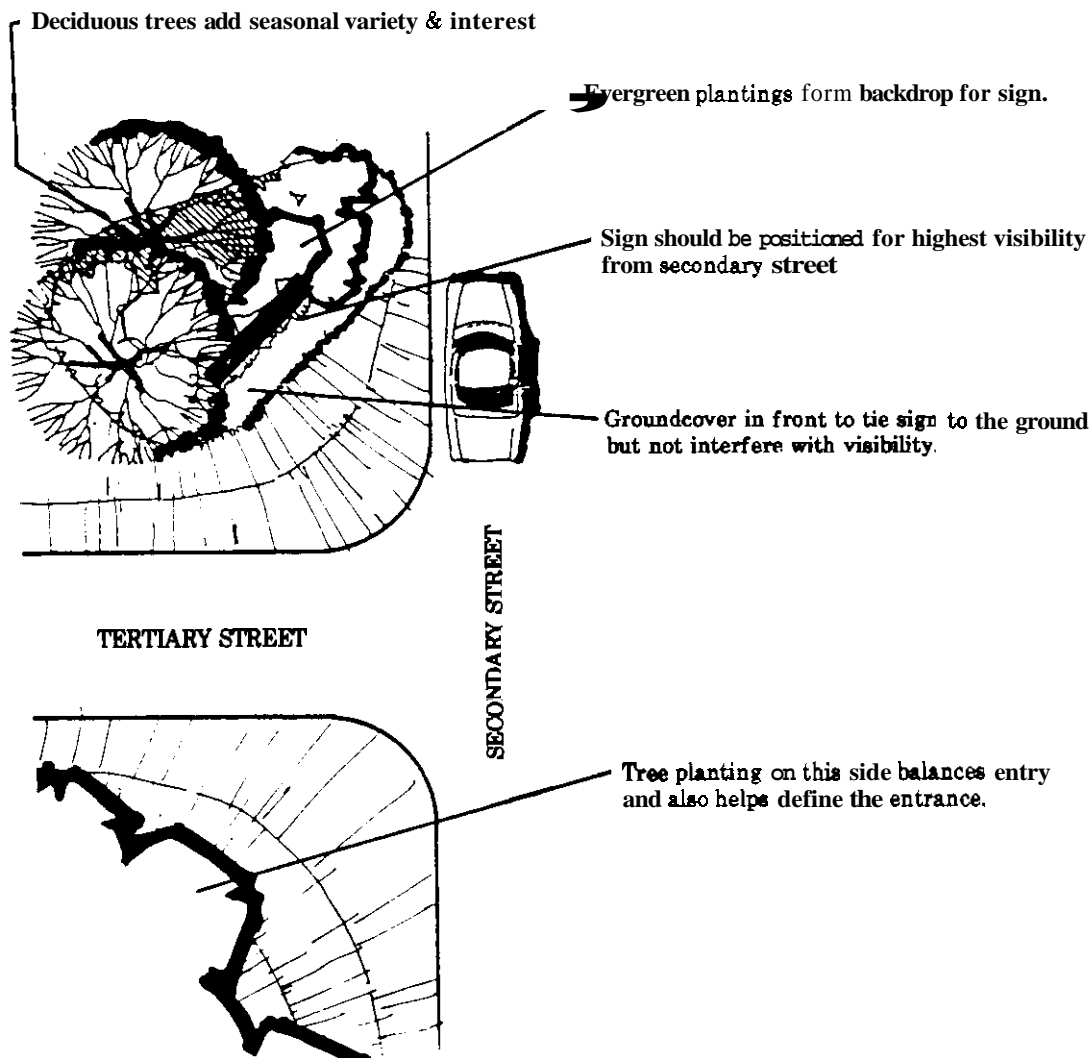


SIGNAGE

HEADQUARTERS/AREA

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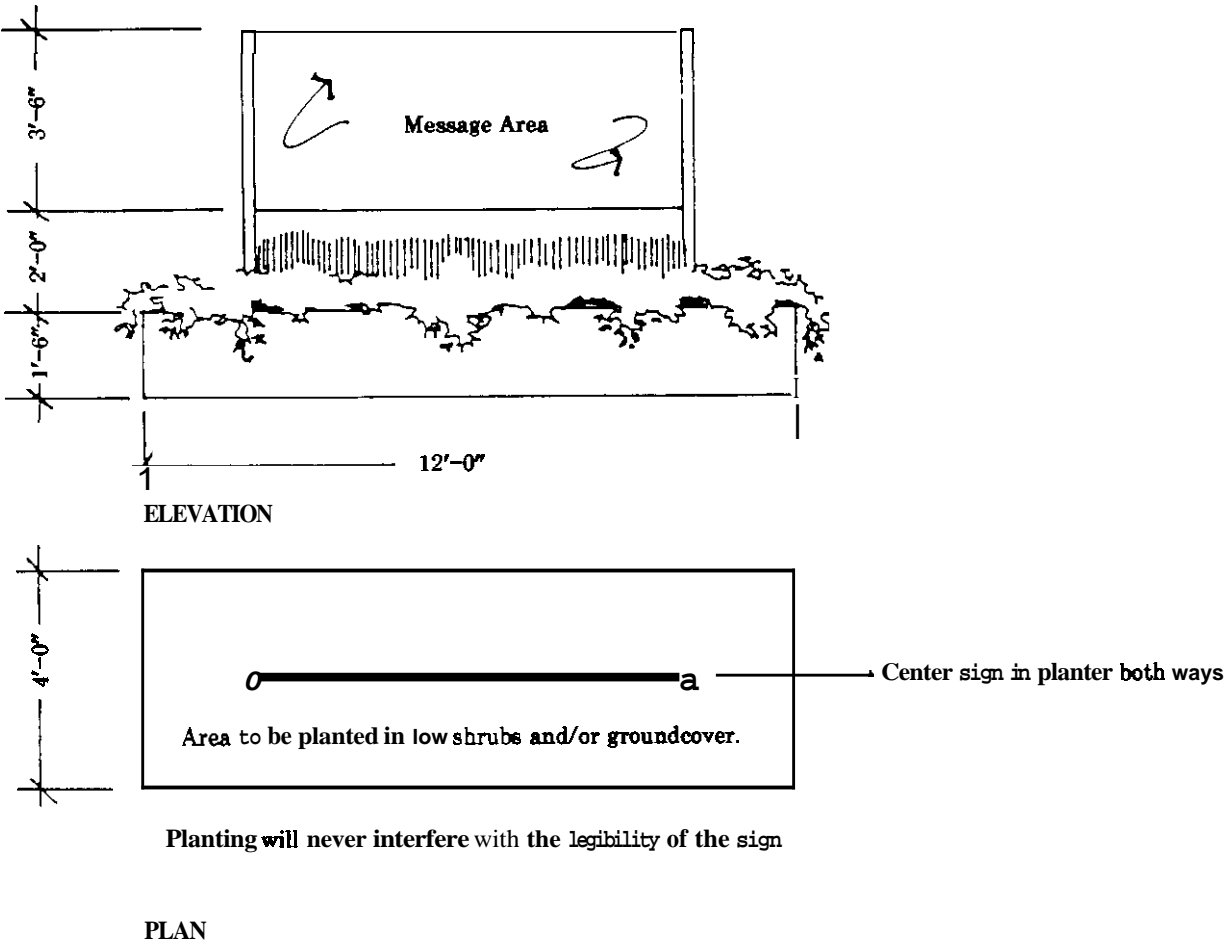
This would work for small areas **such as** a housing entrance.



SIGNAGE

HEADQUARTERS/AREA

In areas where the designer feels that an architectural treatment of the sign is appropriate, it must follow these general guidelines. The sign base may be constructed of materials and in the style of the building which the sign identifies.

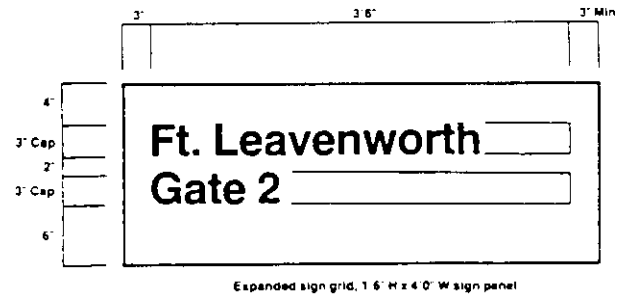
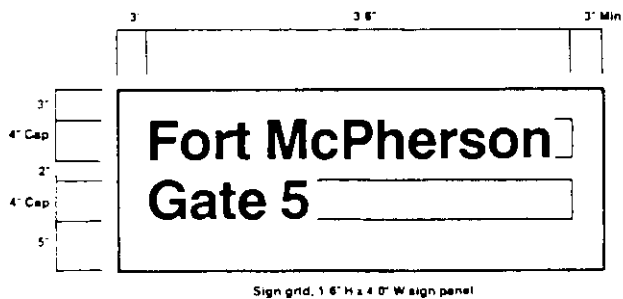
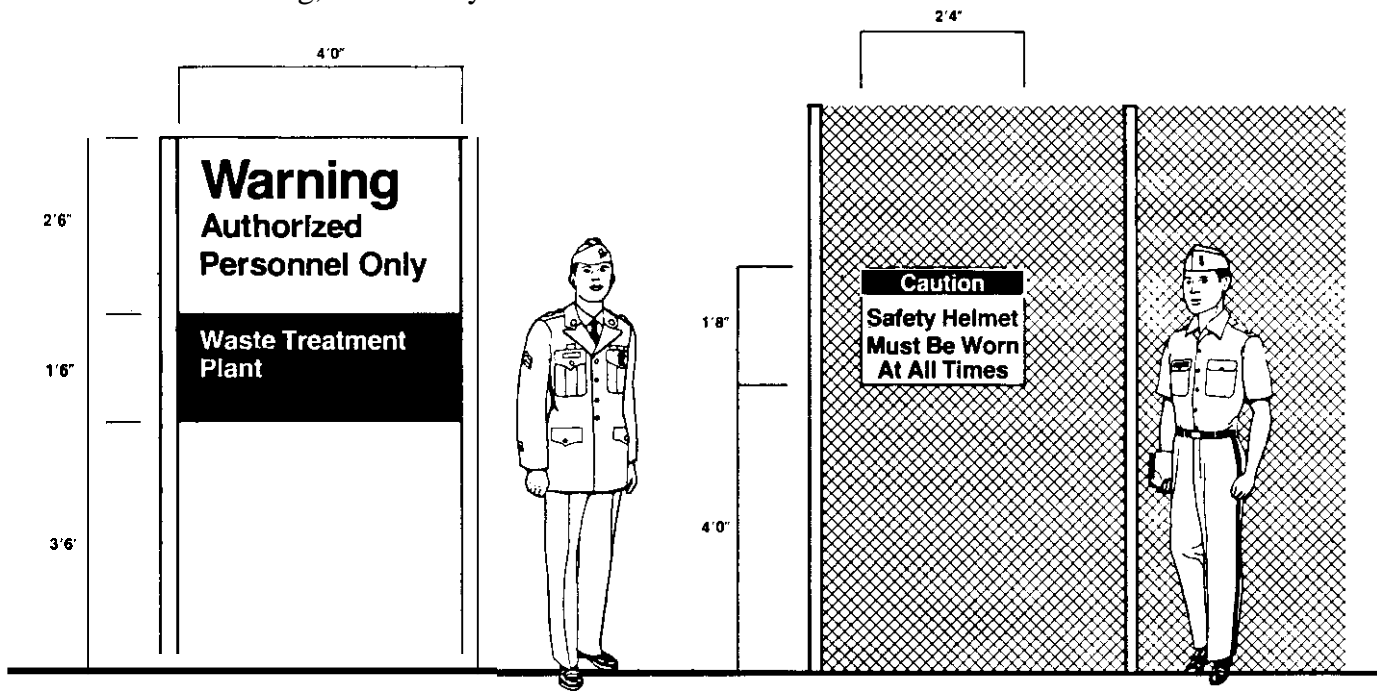


# SIGNAGE

## PROHIBITORY WARNING

### Prohibitory Warning :Sign Types AS, C7, G4

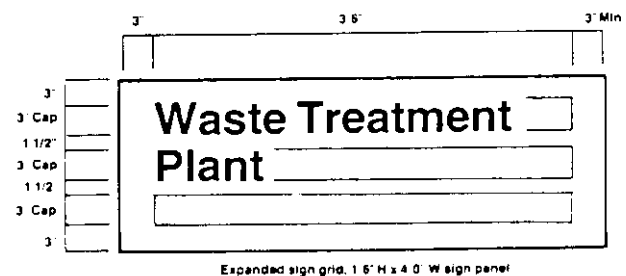
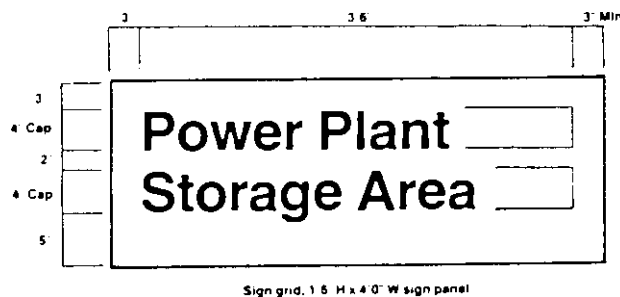
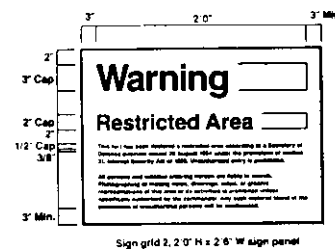
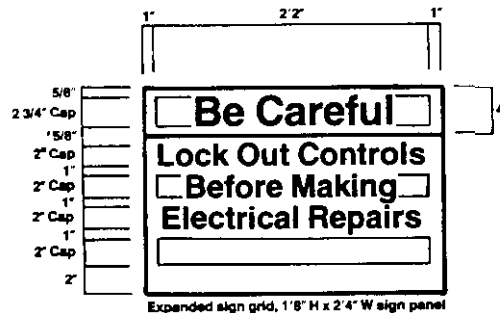
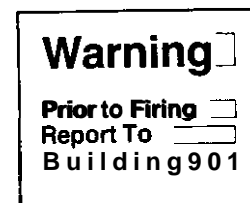
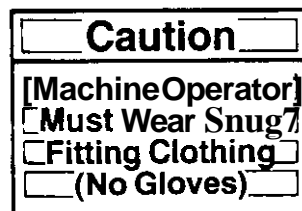
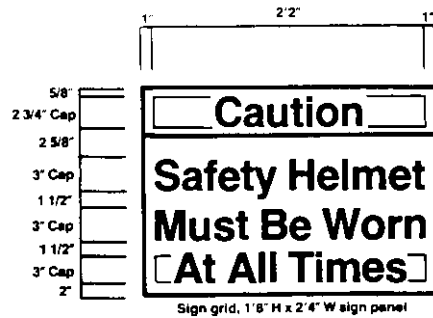
To be used at: Secondary Post entrances, restricted areas, displays for unit morale, points at areas of warning, or as safety reminders.





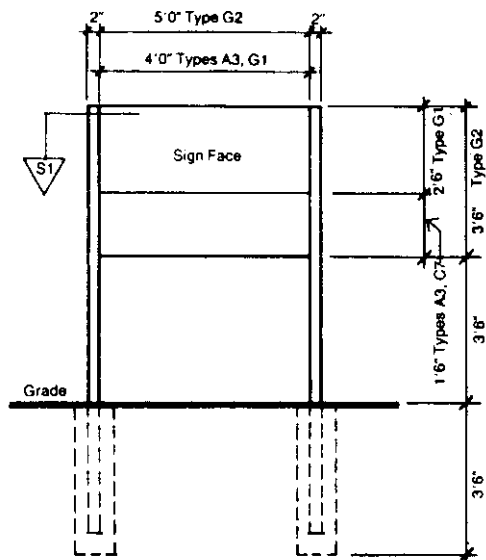
# SIGNAGE

## PROHIBITORY WARNING



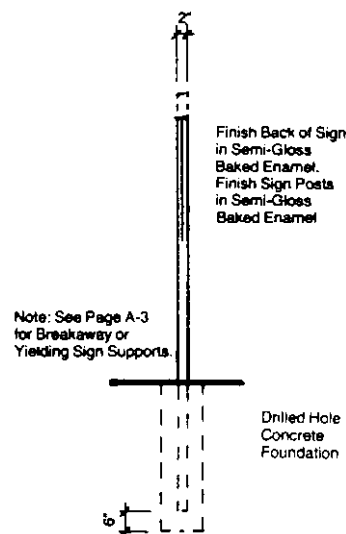
# SIGNAGE

## PROHIBITORY WARNING

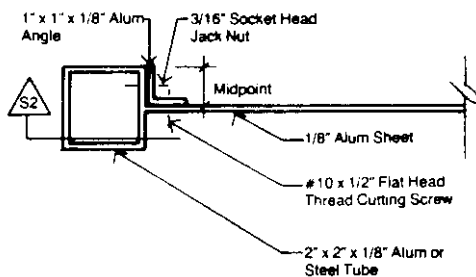


Front Elevation Sign Types A3, C7, G1, G2

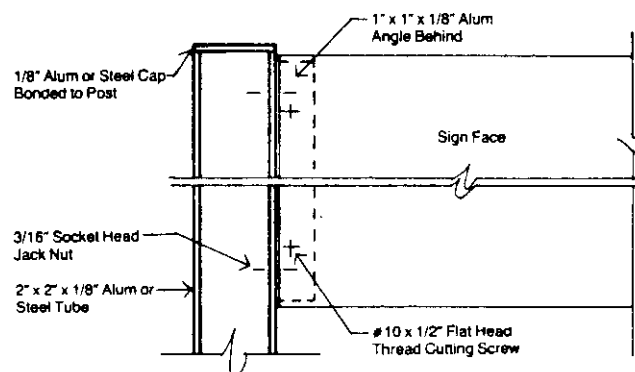
Note: Refer to sign type descriptions for color specifications.



Section

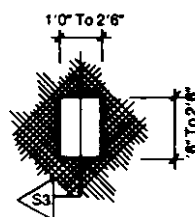


S1 Horizontal Section



S2 Vertical Section

1'0" To 2'6"

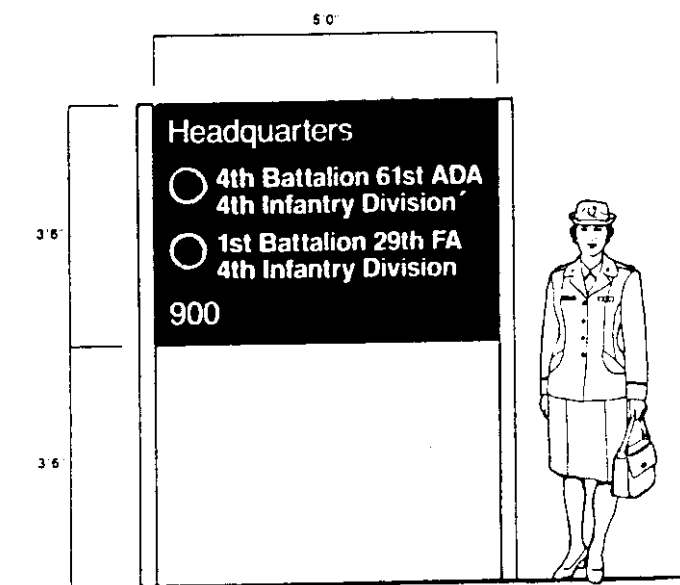


Wall-mounted

Fence-mounted



To be used at: Battalion Headquarters (headquarters' building entrances and points of warning) or for Post directories.



3 6 3

3 4 6 3 Mi

3

4 Cap

4

3 Cap 11/2

3 Cap 3'

3 Cap 11/2

3 Cap

5

4 Cap

4'

Headquarters

4th Battalion 61st ADA  
4th Infantry Division

1st Battalion 29th FA  
4th Infantry Division

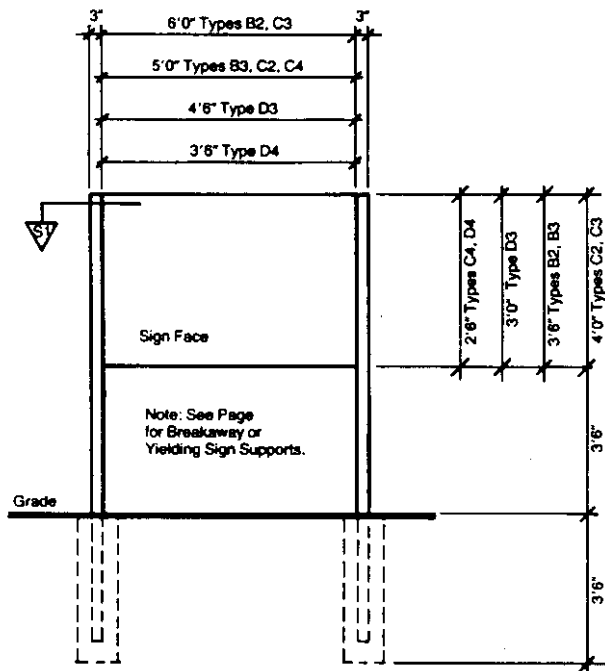
900

Sign grid, 3 6" H x 5 0" W sign panel



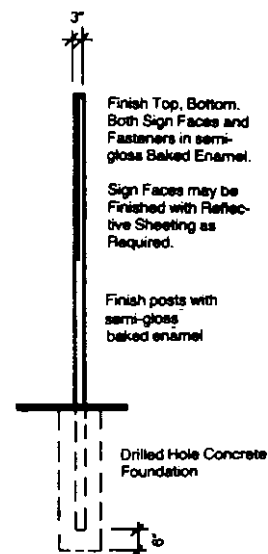
# SIGNAGE

## EXTERIOR IDENTIFICATION

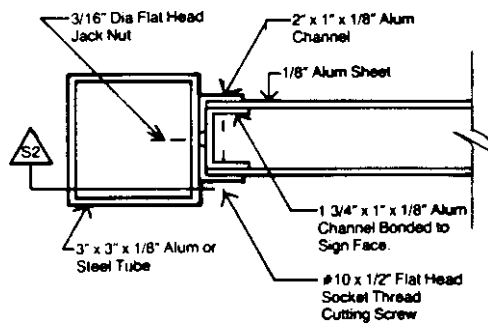


**Front Elevation** Sign Types B2, B3, C2, C3, C4, D3, D4

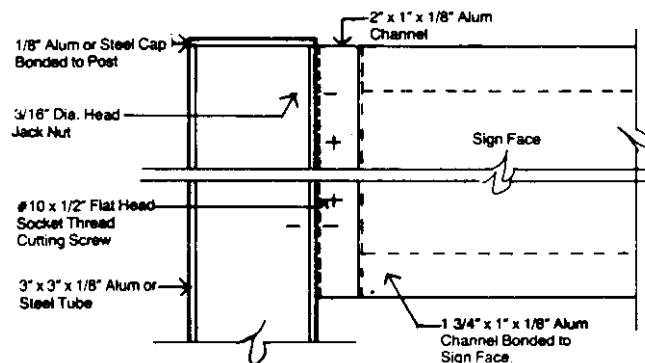
Note: Refer to sign type descriptions for color specifications.



**Section**



**S1 Horizontal Section**



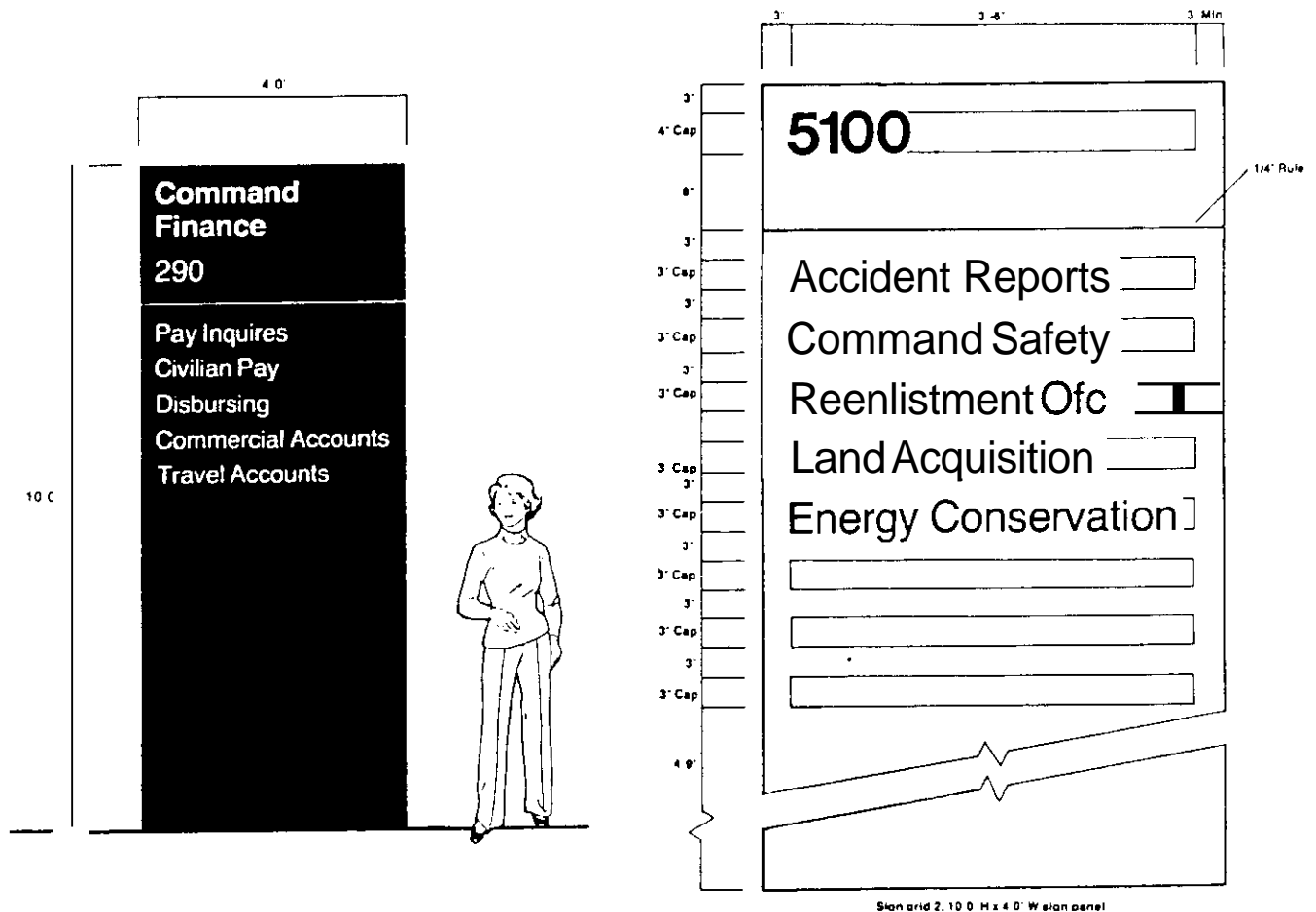
**S2 Vertical Section**

# SIGNAGE

## CENTRALIZED FACILITIES

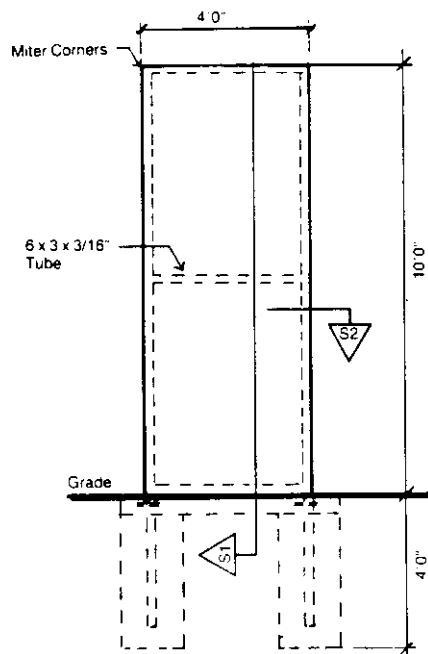
### Centralized Facilities :Sign Type C1

To be used at: Primary centralized military and community facilities.



# SIGNAGE

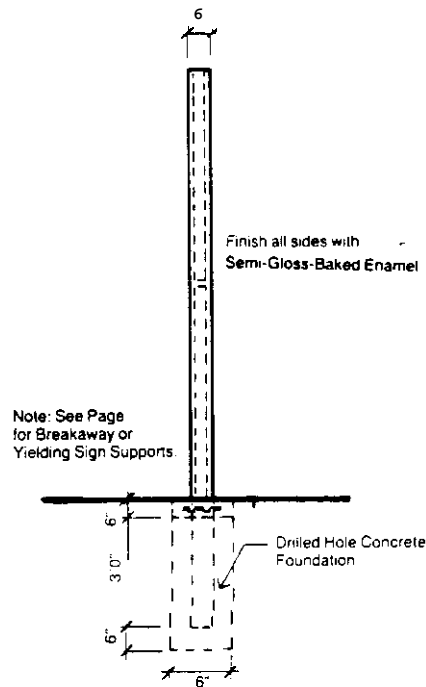
## CENTRALIZED FACILITIES



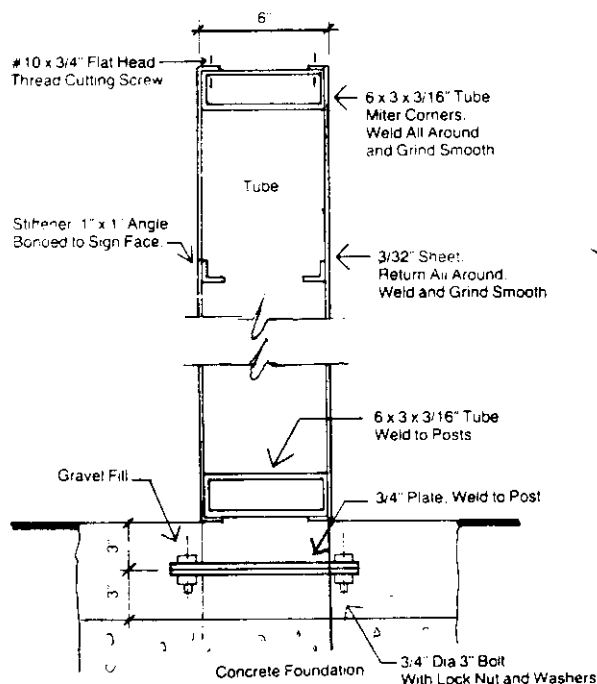
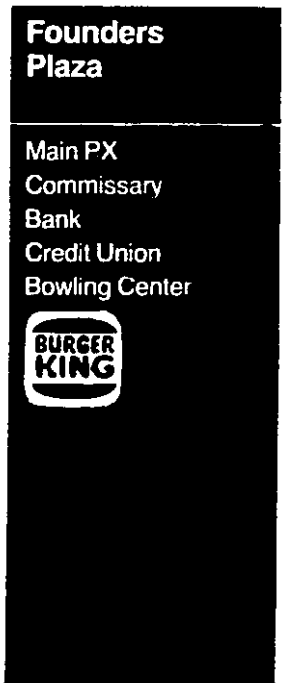
Front Elevation

Sign Types C1, D1

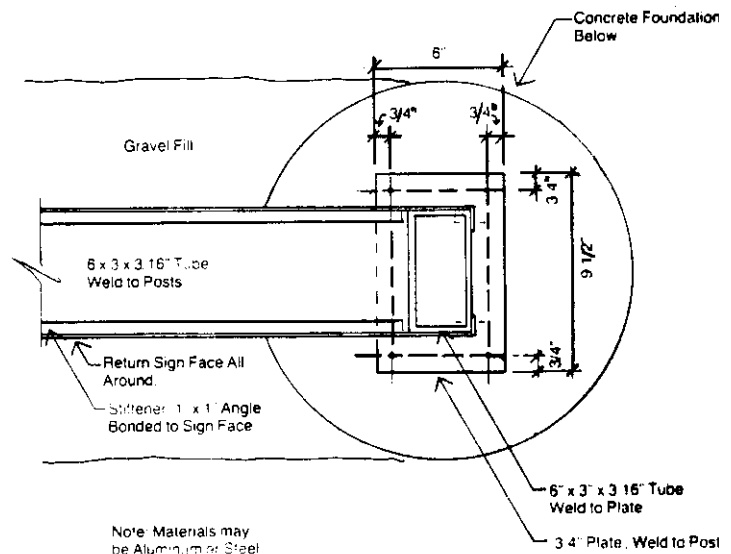
Note: Refer to sign type descriptions for color specifications



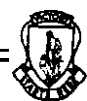
Side Elevation



S1 Vertical Section



S2 Horizontal Section



# SIGNAGE

## CHANGEABLE MESSAGE BOARD

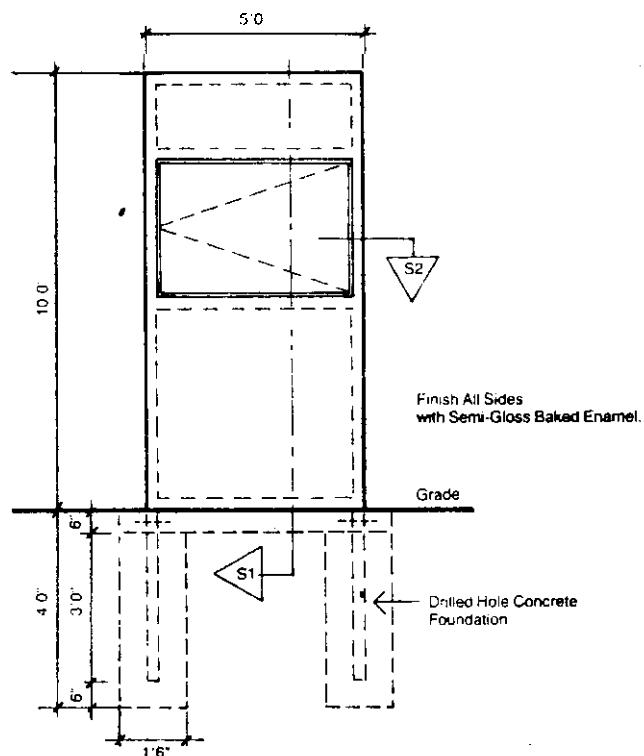
### Changeable Message Board :Sign Type D2

**To be used at:** All facilities requiring a changeable message board, such as: theatres, service clubs, chapels, etc.



# SIGNAGE

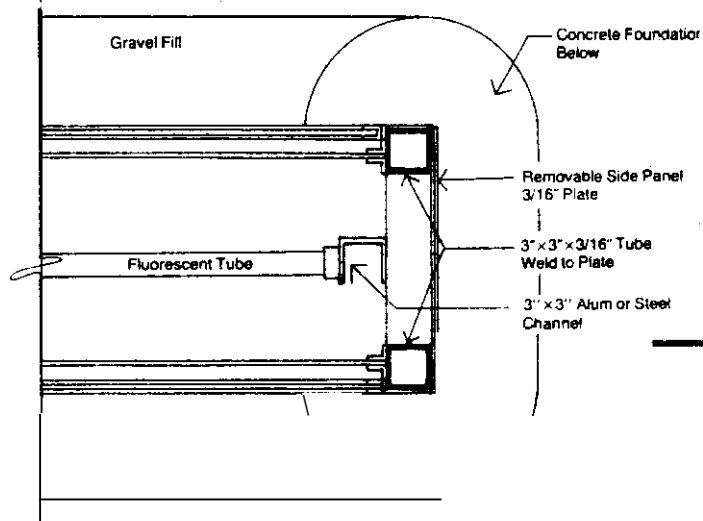
## CHANGEABLE MESSAGE BOARD



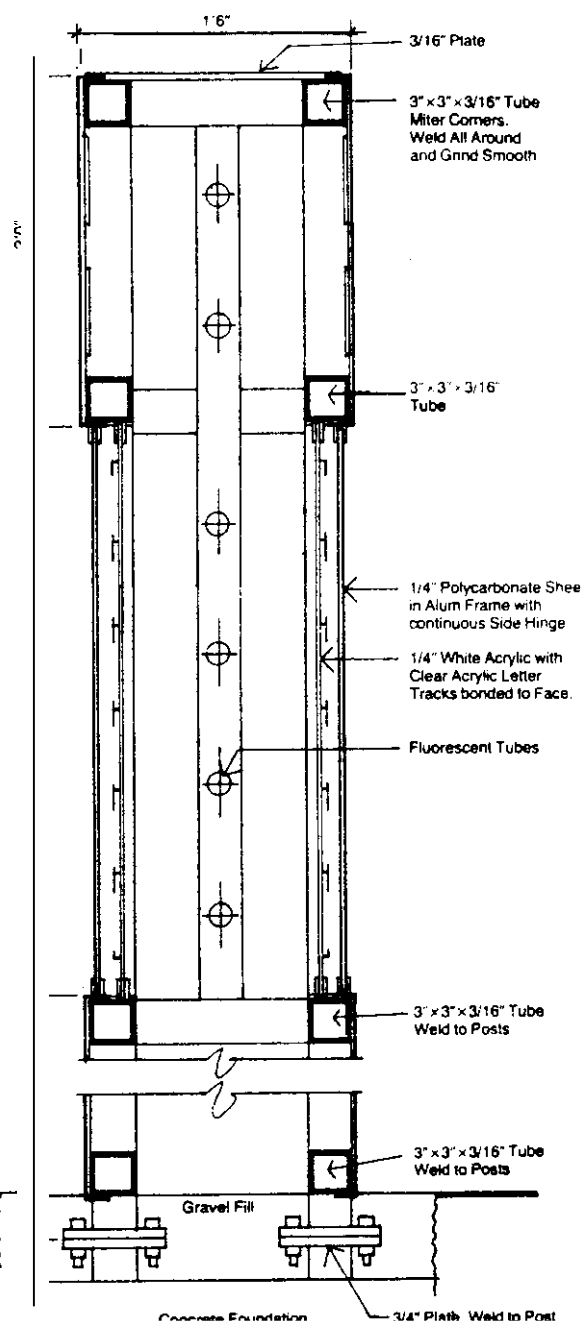
Front Elevation

Sign Type D2

Note: Refer to sign type description for color specifications.



S2 Horizontal Section



S1 Vertical Section



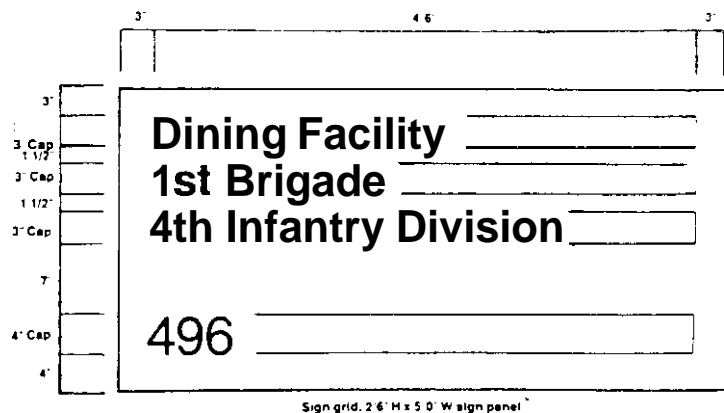
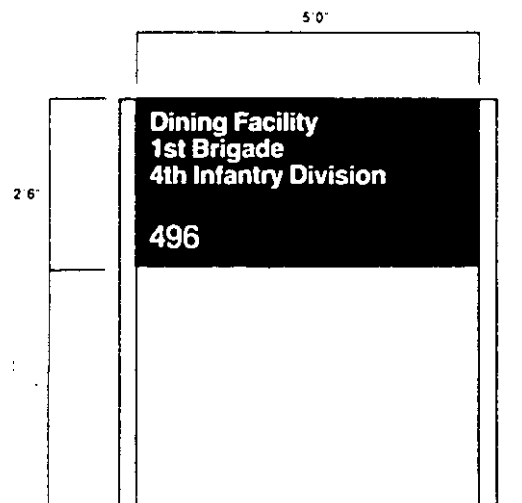
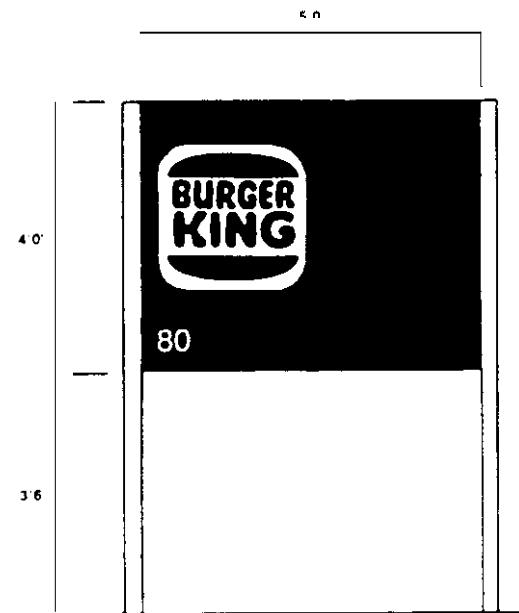


## SIGNAGE

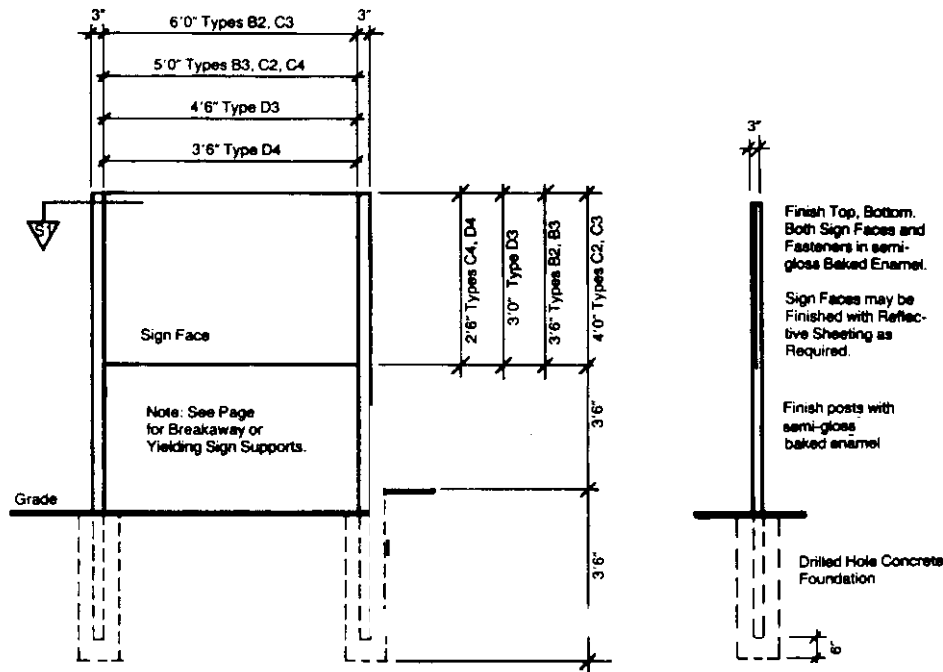
### FACILITY ENTRANCE

#### Facility Entrance : Sign Types **a, c4**

To be used at: Secondary centralized military and community facilities, primary military and community facilities, areas of warning, vehicular directional information, and for standard morale signs.



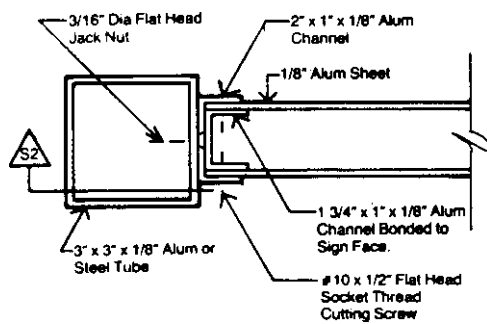
# SIGNAGE FACILITY ENTRANCE



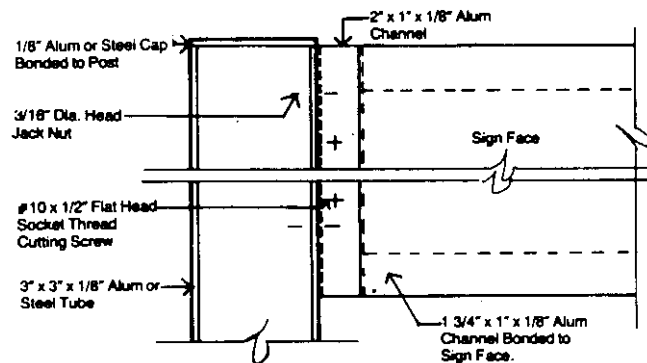
**Front Elevation** Sign Types B2, B3, C2, C3, C4, D3, D4

**Section**

Note Refer to sign type descriptions for color specifications



**S1 Horizontal Section**



**S2 Vertical Section**

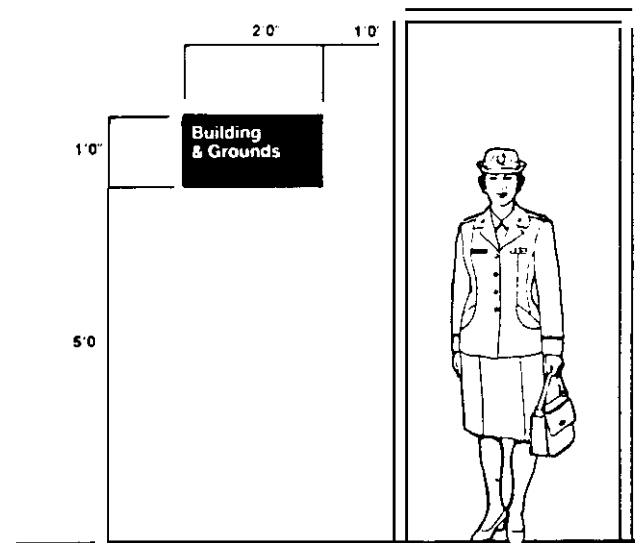
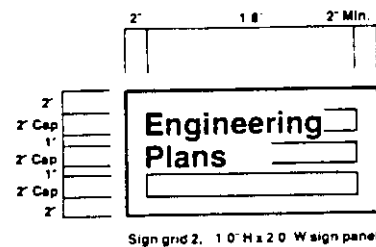
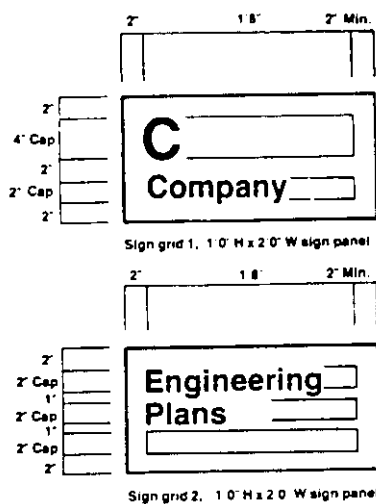
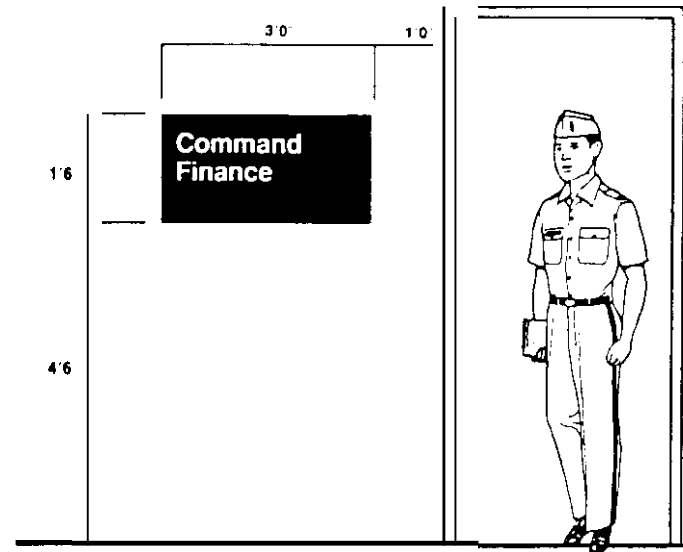
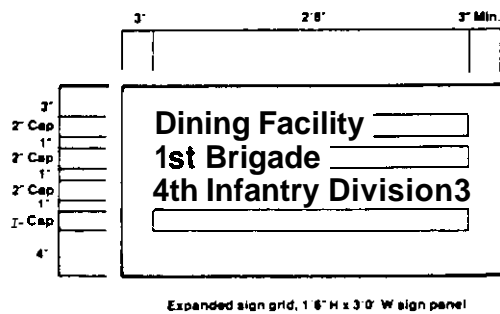
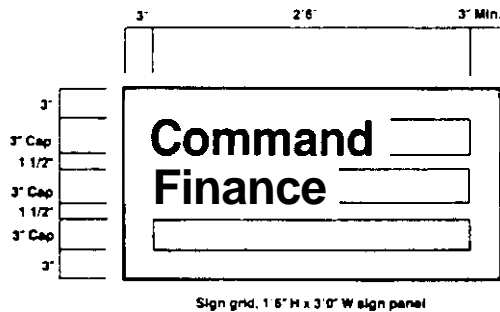


## SIGNAGE

### FACILITY ENTRANCE

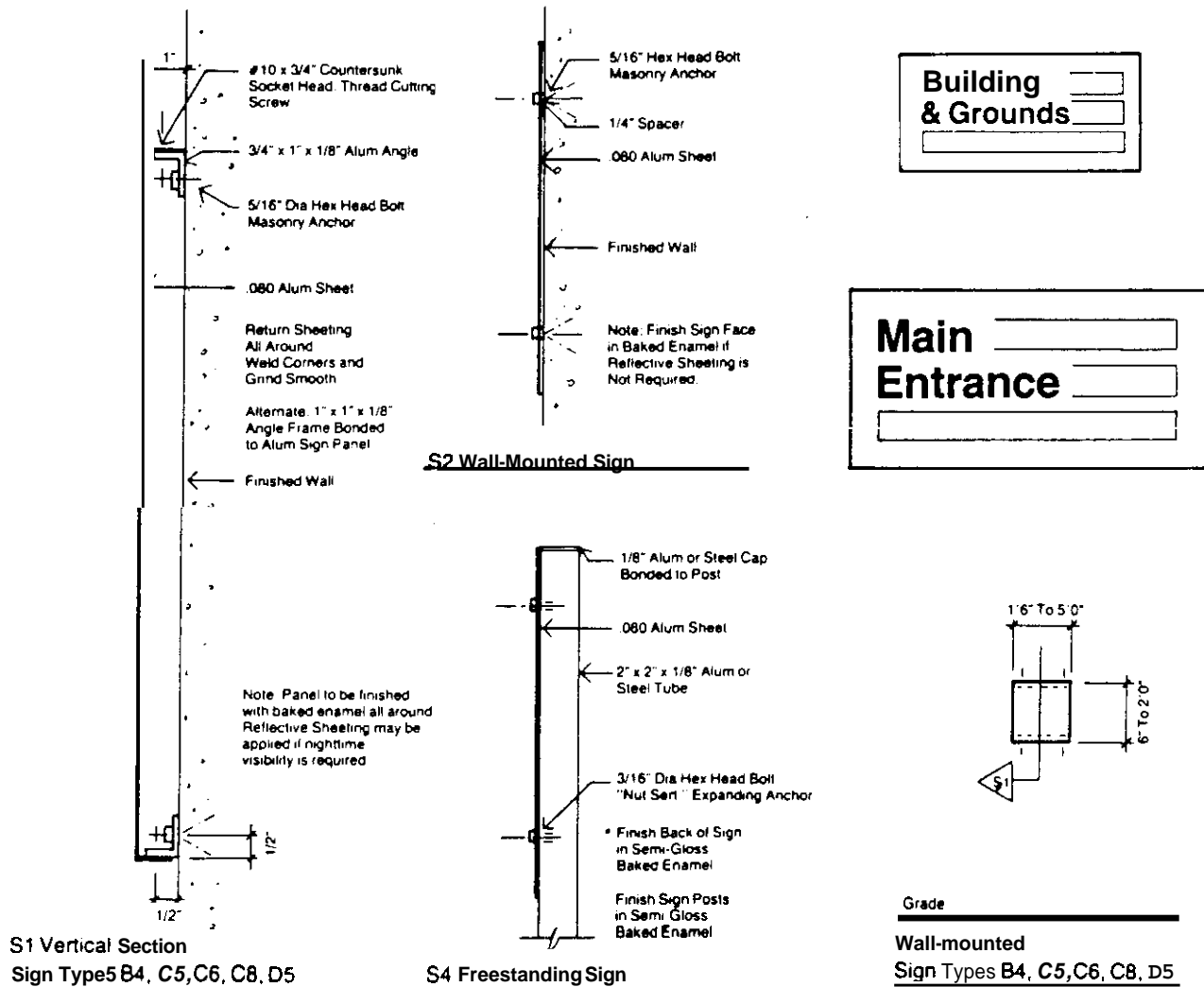
#### Sign Types C3, C4

To be used at: Military and community building entrance both primary and secondary as needed, and for vehicular directional information.



# SIGNAGE

## FACILITY ENTRANCE

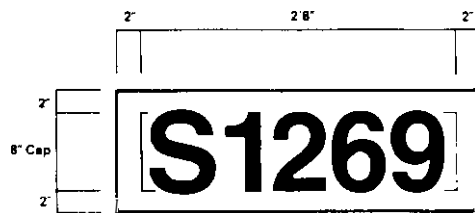


# SIGNAGE

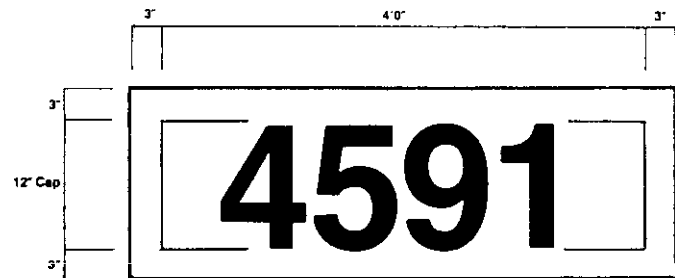
## BUILDING NUMBERS

### Building Numbers

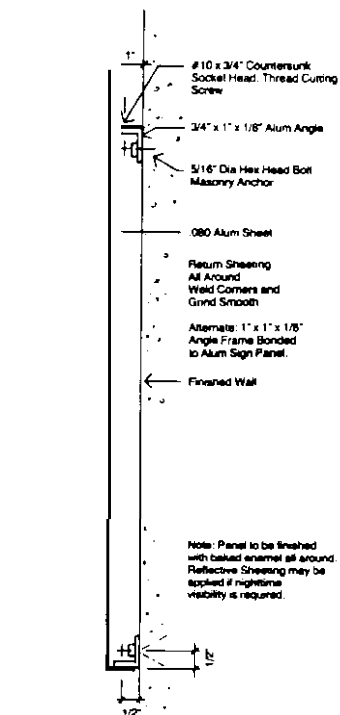
To be used on all permanent and semi-permanent military and community buildings. Building numbers for temporary buildings shall be applied as painted stencils in a contrasting color to the wall surface. Stencils shall be of a size and letter size similar to the signs shown. Numbers shall be placed in prominent locations on each building. Housing numbers are to be reflective white on black background.



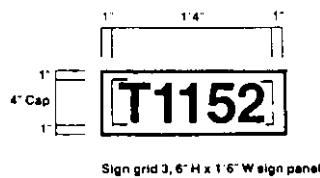
Sign grid 2, 1'0" H x 3'0" W sign panel



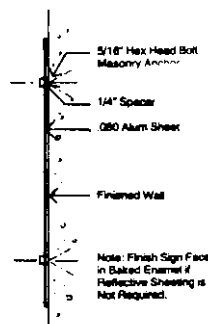
Sign grid 1, 1'6" H x 4'6" W sign panel



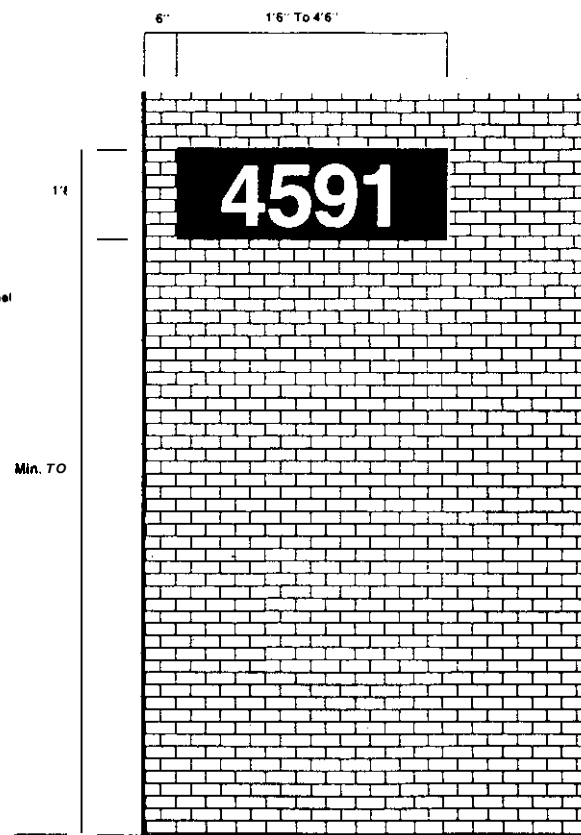
S1 Vertical Section  
Sign Types B4, C5, C6, D5



Sign grid 3, 6" H x 1'6" W sign panel



S2 Wall-Mounted Sign



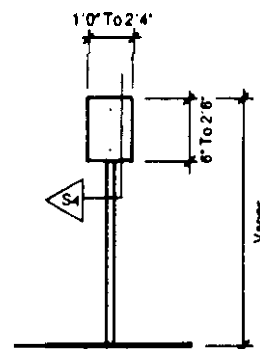
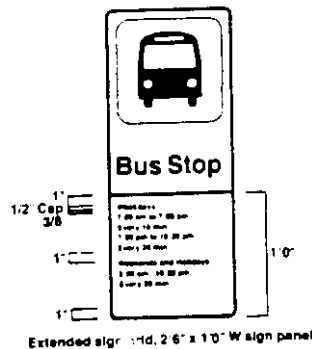
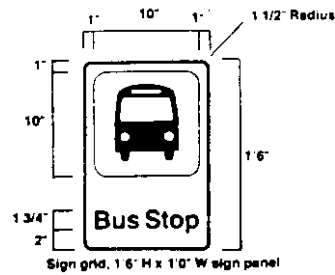
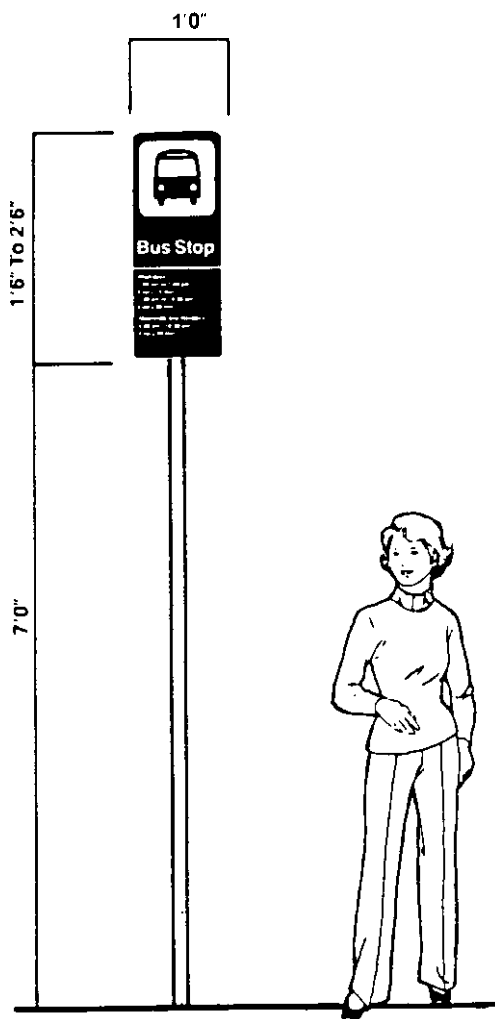


# SIGNAGE

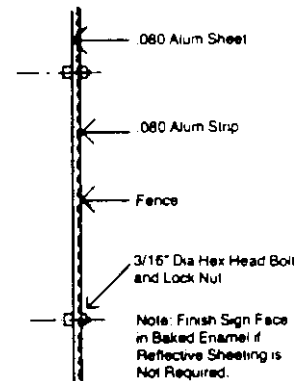
## BUS ROUTE

### Bus Route

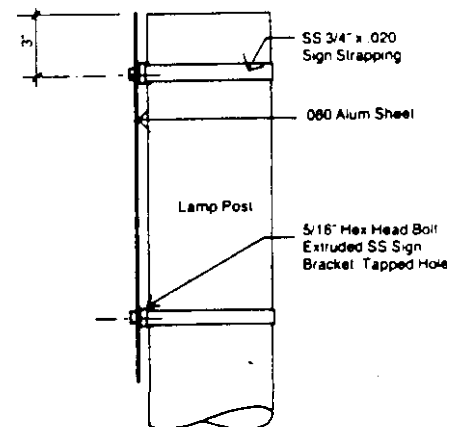
To be used at all bus stops for public, military and school bus systems. Sign may be mounted on free standing post or attached to light pole.



Free-standing  
Sign Types D7, G5, G6



S3 Fence-Mounted Sign



S4 Alternate Detail



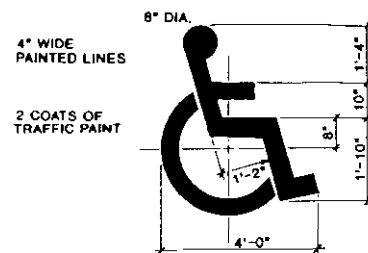
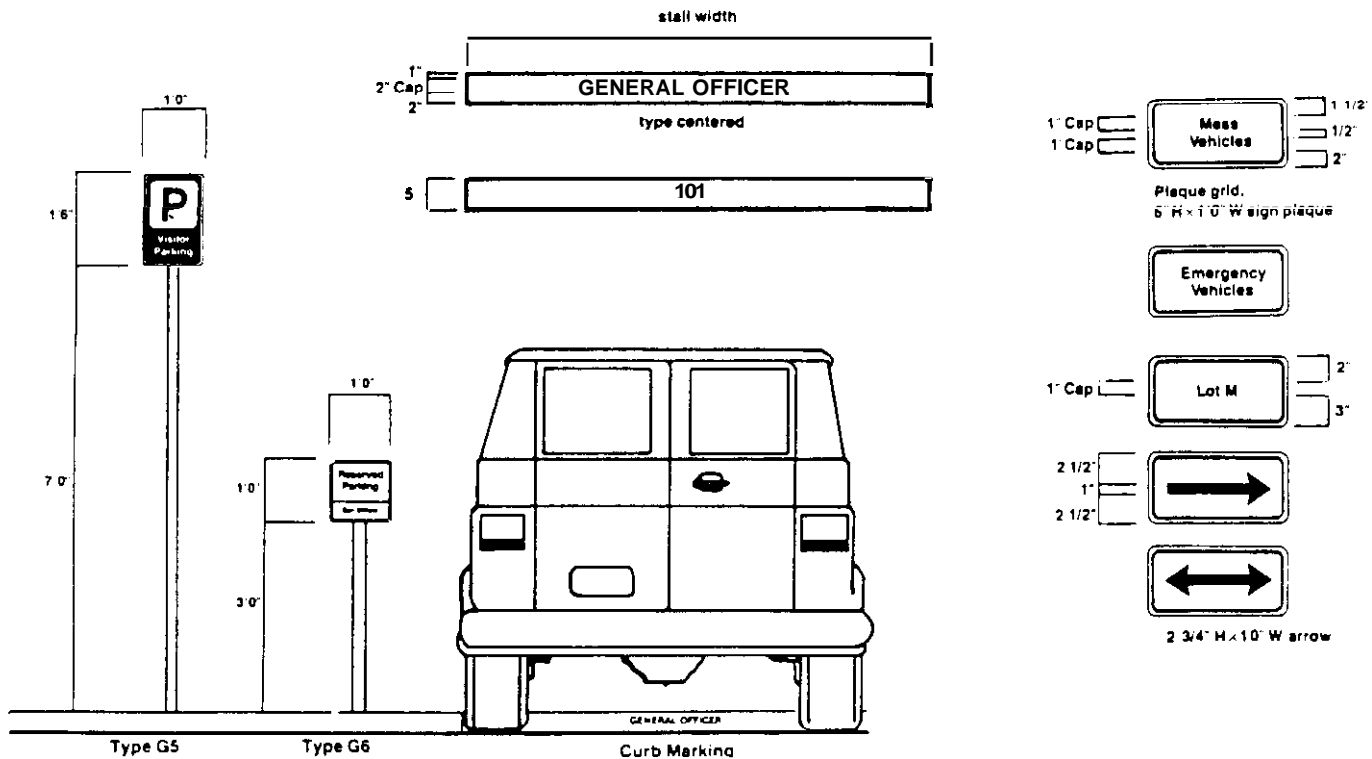
# SIGNAGE

## PARKING/CURB MARKINGS

### Parking/Curb Markings

To be used as needed. Curb or pavement markings are to be used as a first alternative with sign standards being used only in cases where curb or pavement markings are determined to be inadequate.

Where sign standards are deemed appropriate, signs shall be fabricated to TRADOC sign standards.



Handicapped Parking Pavement Detail

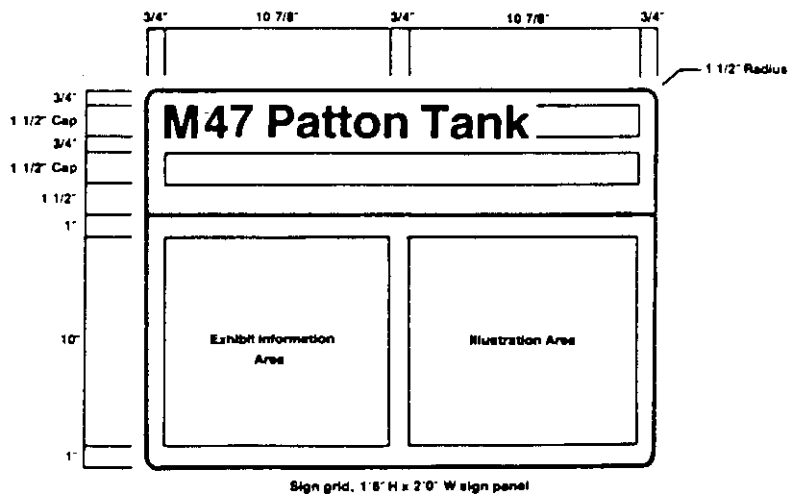
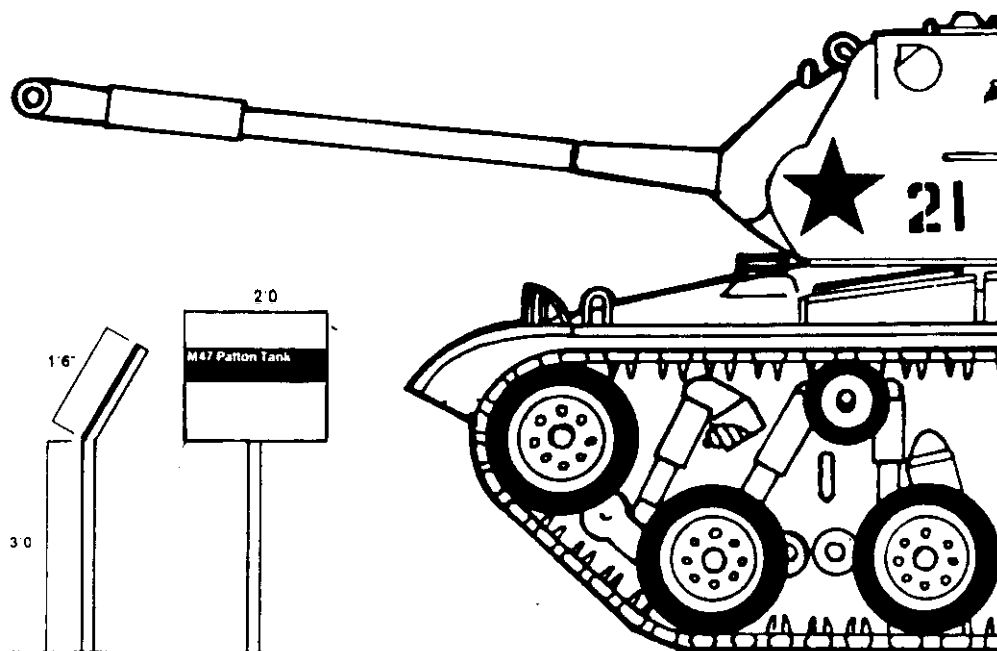




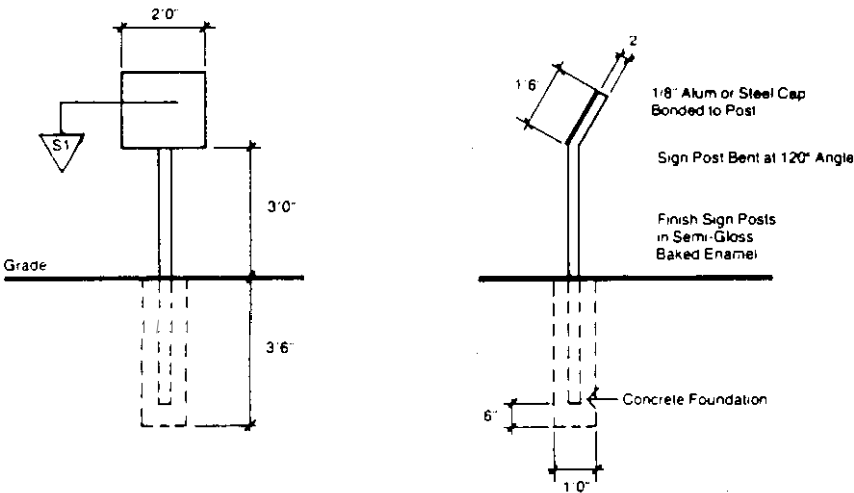
**SIGNAGE**  
**EXHIBIT/INFORMATION**

### Exhibit/Information

**To** be used at all exhibit **or** interpretive displays.



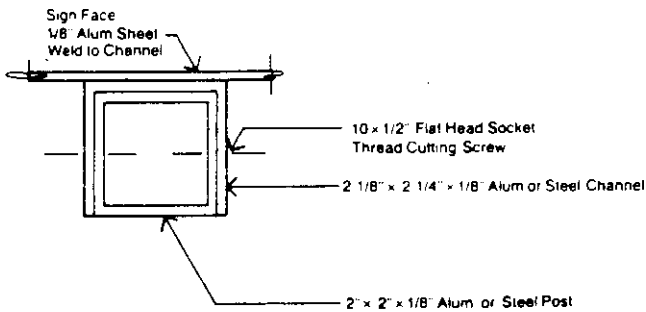
**SIGNAGE**  
**EXHIBIT/INFORMATION**



**Front Elevation Sign Type H1**

Note: Refer to sign type description for color specifications

**Section**



**S1 Vertical Section**

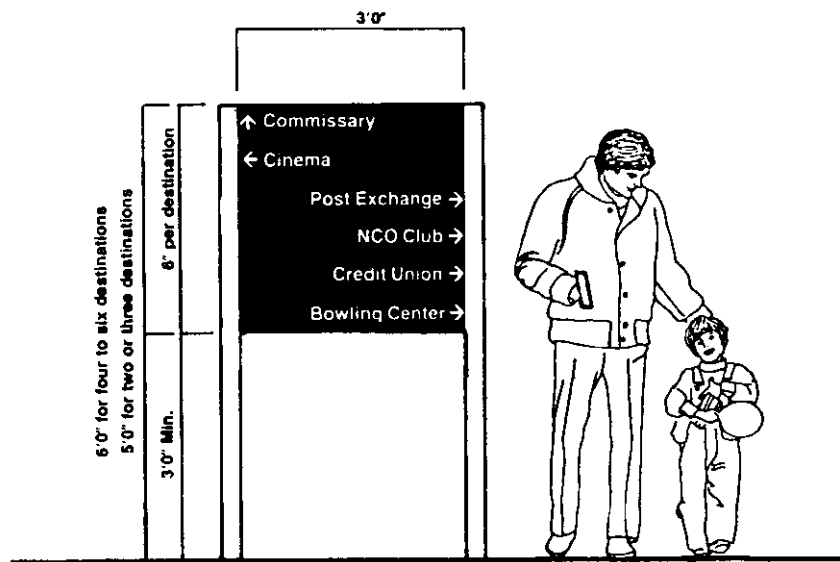


# SIGNAGE

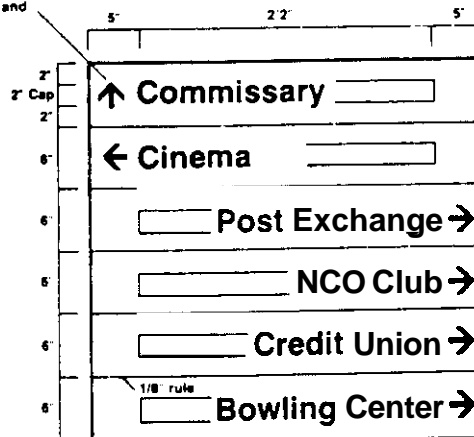
## PEDESTRIAN INFORMATION

### Pedestrian Information

To be used for pedestrian, and bicycles path directional information.



Center the arrow in the space between the message and the edge of the sign

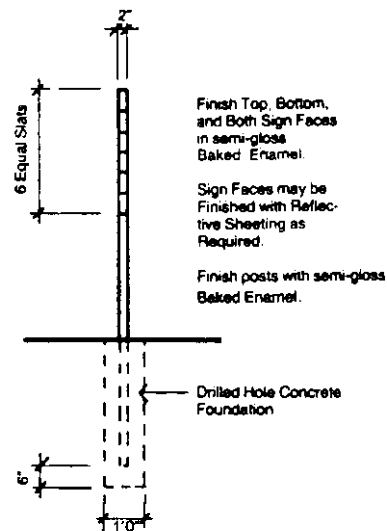
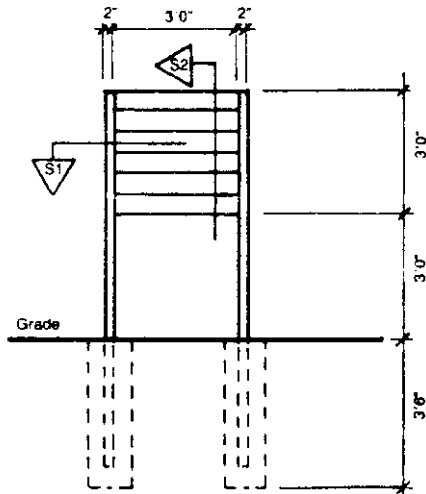


Sign grid Variable height x 30' W sign panel



# SIGNAGE

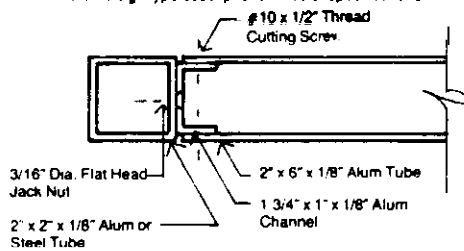
## PEDESTRIAN INFORMATION



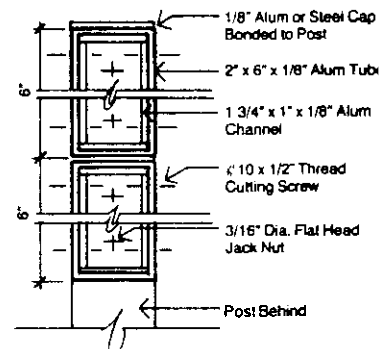
Front Elevation

Sign Type H2

Note Refer to sign type descriptions for color specifications

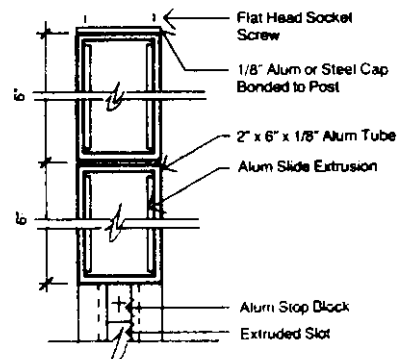
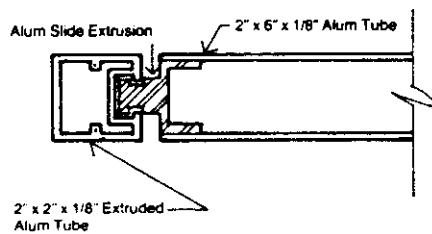


Section



S1 Horizontal Section

S2 Vertical Section



S1 Alternate Horizontal Section

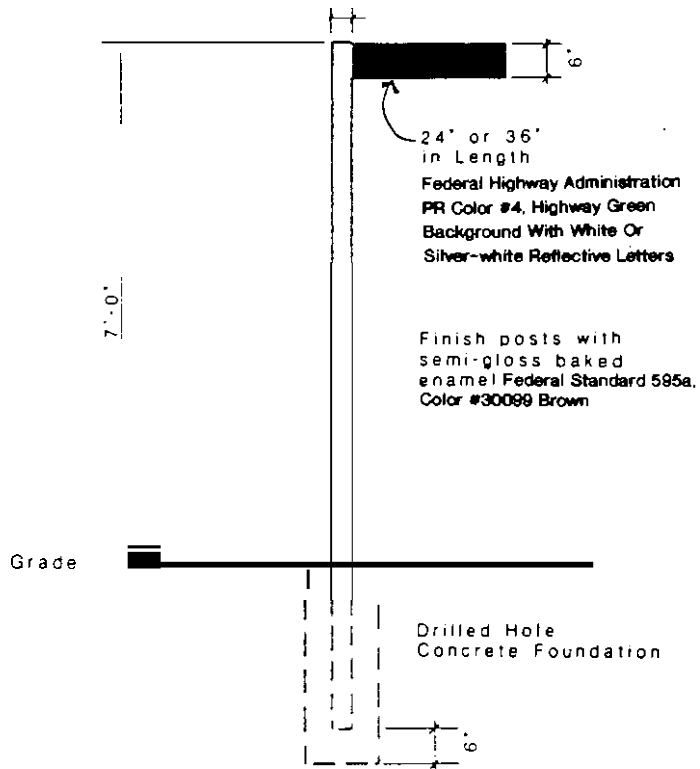
S2 Alternate Vertical Section



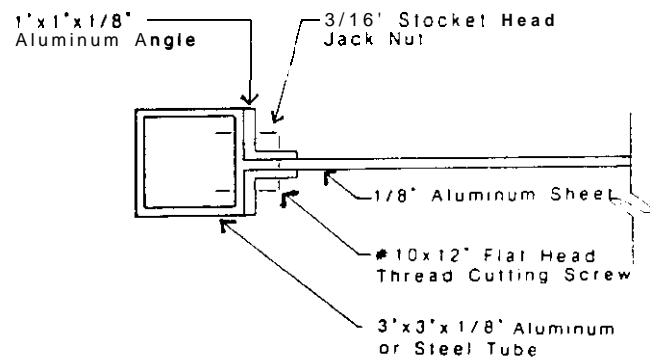
# SIGNAGE

## STREET SIGNS

### Street Signs



**Front Elevation**



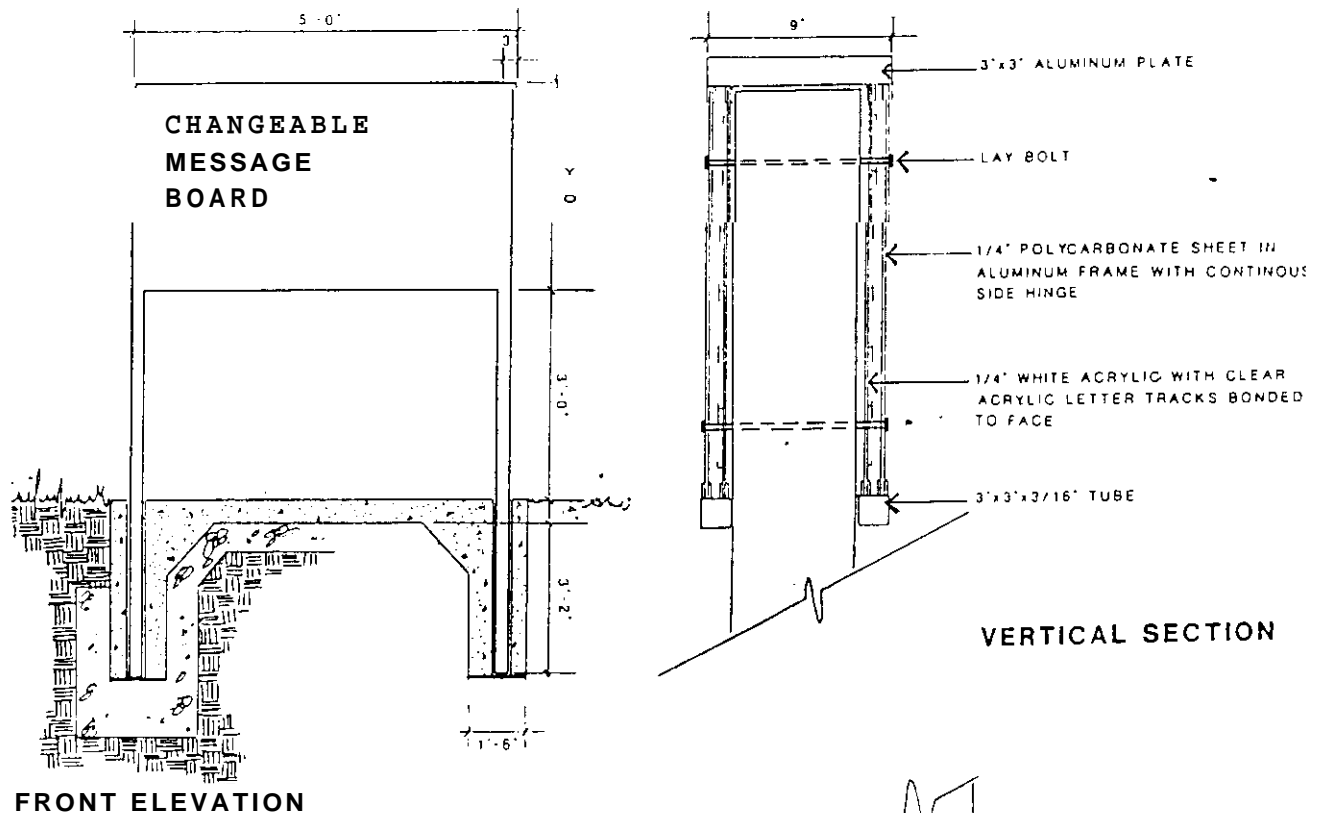
**Horizontal Elevation**



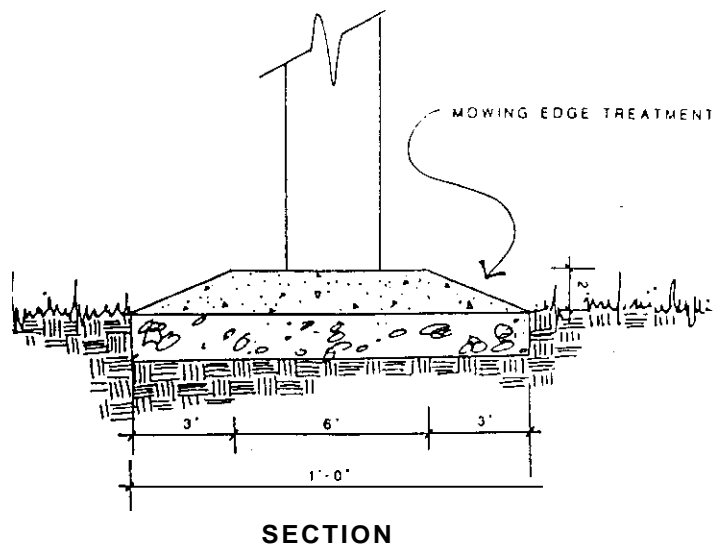
## SIGNAGE TEMPORARY SIGNS

### Fixed Location/Removable

Locations for this type of temporary sign will be determined in the Sign Location Plan for the Post. The footings can then be installed and signs erected for special occasions for short periods of time.



Posts: Federal Standard 595a, Color #30099, Brown

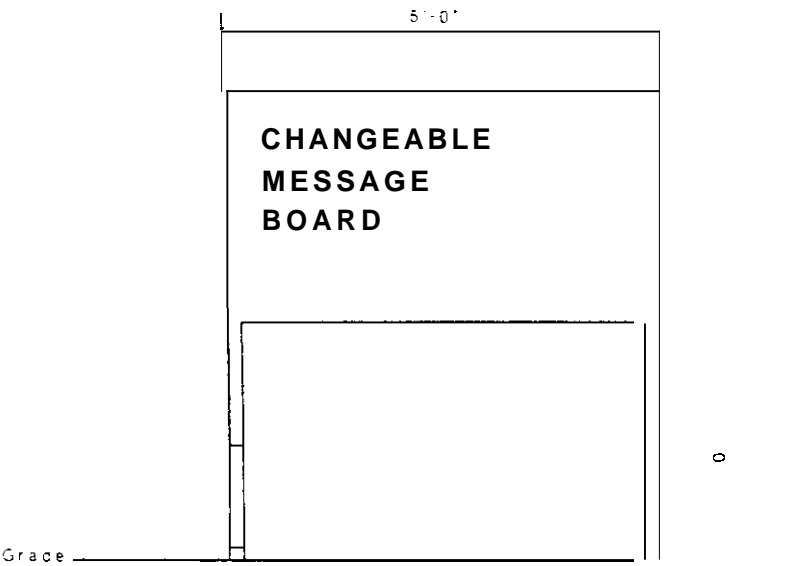


SIGNAGE

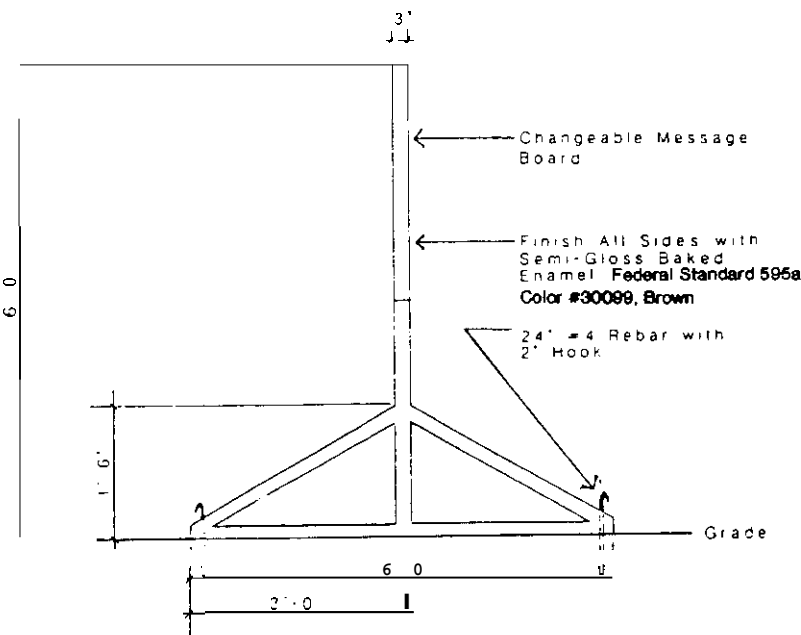
TEMPORARY SIGNS

Portable

This temporary sign is constructed to allow free mobility in placement. The sign is to be used for special events and will only be erected for short periods of time. A concerted effort is to be made to keep these signs to a minimum; and their prompt removal after an event is mandatory.



Front Elevation

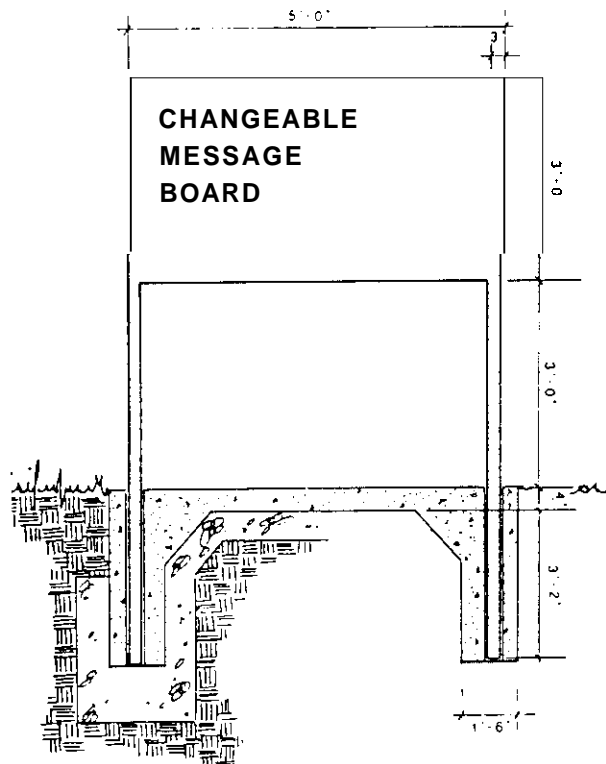


Vertical Section



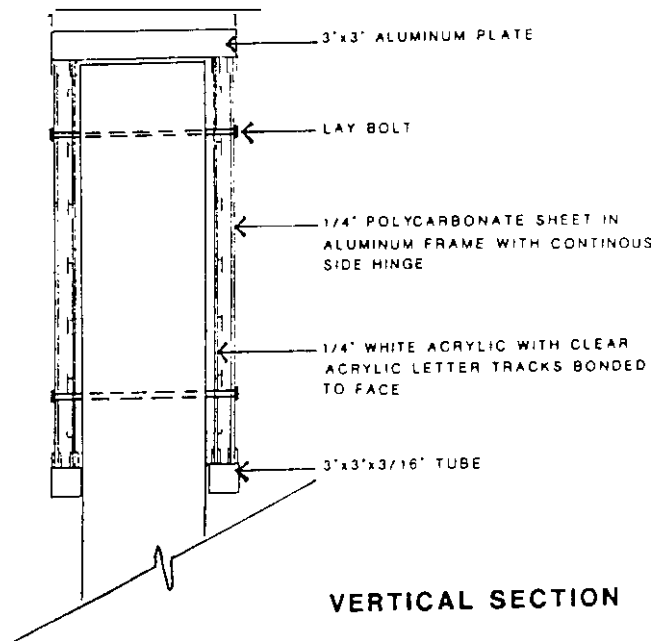
# SIGNAGE

## TEMPORARY SIGNS

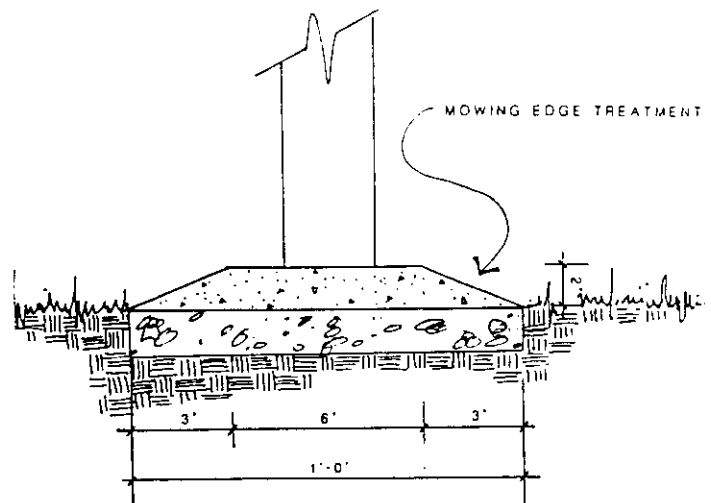


**FRONT ELEVATION**

Posts Federal Standard 595a Color #30099, Brown



**VERTICAL SECTION**



**SECTION**





# LIGHTING AND UTILITIES

## GENERAL INFORMATION

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### Purpose

These guidelines deal with the visual impact of lighting and utilities and the resulting effect on the image of Fort Jackson. Sensitive siting of these necessary elements can greatly enhance the impression of the Installation both in daylight and nighttime hours.

### Lighting

Lighting provides a sense of security and even comfort to persons, especially in unfamiliar surroundings. Uneven distribution of light creates “dark pockets” in some areas and too much light in other areas. The even distribution of light in the appropriate intensities requires technical skill and a close collaboration of lighting consultants with electrical engineering and landscape architectural disciplines. Aesthetic and technical considerations must be taken into account in the detail design of all projects, both large and small to insure an appropriate lighting system. These Guidelines deal with the visual considerations of proper light distribution and the aesthetics of the fixtures themselves and do not deal with the technical aspect of lighting design.

### Utilities

Utility systems are rarely designed for aesthetic appeal. Typically, utility systems favor the purely functional. Utility lines and structures are all too often located without any consideration of their impact on the visual environment. Function and aesthetics should be considered when locating utilities.

Utility systems and structural elements should be located in the least conspicuous locations away from entrances and primary circulation routes. Utilities should be placed underground whenever possible.



## LIGHTING AND UTILITIES

### DESIGN OBJECTIVES

---

#### Design Objectives

The following goals have been established for lighting and utilities that will alleviate their often negative visual impact.

Reduce the negative visual impacts of lighting and utilities by:

- o selecting light fixtures that will enhance the visual theme on Post.
- o considering safety, function, and aesthetics when locating light fixtures.
- burying all utility lines whenever possible.
- o locating utility lines behind buildings or trees to screen them from view.
- o screening utilities with trees and shrubs.

A well designed lighting system should:

- mark the points of decision.
- define the direction and the location.
- characterize between roadway and walkway lighting.
- o provide sufficient light at pedestrian crossings.
- o link site lighting with informational and directional signage.
- o emphasize the more attractive structures and site features.
- borrow light from adjacent areas and buildings.
- o eliminate glare.
- o provide consistent light standard locations in relation to intersections and turning points.
- o use standardized fixtures, globes and fittings.



# LIGHTING AND UTILITIES

## LIGHTING TYPES

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### Lighting Types

There are a variety of exterior lighting types available. Each lighting type has both positive and negative properties in relationship to efficiency, color, light and longevity. The following listing characterizes the different exterior lighting types.

**HIGH PRESSURE SODIUM**—This light source is very efficient, relatively long lived, with a high lighting level. The light color is in the pink to orange range which is not flattering to plants or people. These lamps also have good cold weather characteristics.

**MERCURY VAPOR**—The mercury vapor lamp is longer lived than any other source mentioned here, which reduces lamp replacement costs; however, it is not **as** efficient as the high pressure sodium and it produces lower lighting levels. The color of the light produced is bluish to greenish and not complementary to people or plants. Color corrected mercury vapor provides a better color but it is much less efficient.

**METAL HALIDE**—Metal halide is between mercury vapor and high pressure sodium in both efficiency and longevity. It has good color rendition and is not psychologically offensive to people, therefore, being the most pleasing light source.

**INCANDESCENT**—This lamp type has the most pleasing color of all light sources. It has the lowest efficiency rating and the shortest lamp life of all available light sources. It is also not suitable for lighting large areas; for these reasons, incandescent lamps should not be used except as an accent light in exterior situations.

**LOW PRESSURE SODIUM**—Low pressure sodium lamps have the highest efficiency range of all light sources which are presently available. The lighting effect is monochromatic yellow and all reflected colors, except yellow, appear **as** shades of gray. While this is a disadvantage in most situations, it is a definite advantage in security lighting. In this type of light, color camouflage **is** not effective and low contrast objects can be distinguished. Like high pressure sodium lamps, these lamps also have a longer rated lamp life. **Low** pressure sodium lamps have the best characteristics for security requirements and energy efficiency.

It is recommended that the existing mercury vapor lights be replaced with lighting that gives a more balanced color of light when the existing lights need replacement.

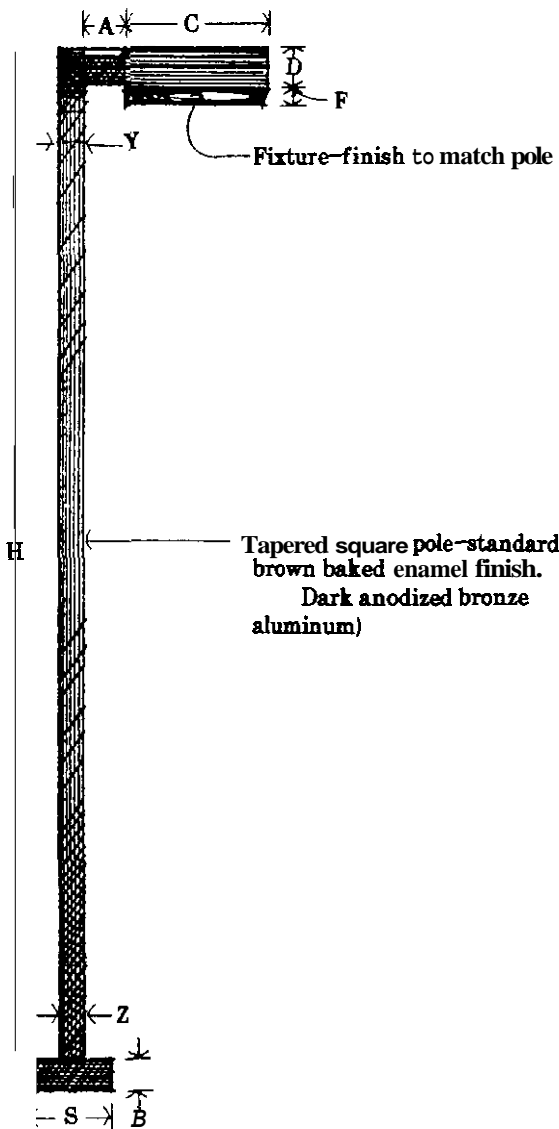


LIGHTING AND UTILITIES

STREET AND PARKING LIGHTS

Standard Metal Pole With Fixture

A standard cut-off or "shoebox" fixture is to be used for all roadway and parking area lights at Fort Jackson. Either single or double mounts are permitted on square aluminum poles. Poles and fixtures are to be finished in a low maintenance standard brown baked enamel with dark anodized bronze aluminum as an alternate. Pole height varies and fixture size is to be in proportion to the pole height.



Standard cut-off fixture

DIMENSIONS				
H Pole Height	12'	20'	25'	40'
Y Top	3"	4"	5"	6"
Z Bottom	5"	6"	8"	10"
B Plate	5/8"	3/4"	3/4"	1"
S Base	10"	10"	14"	17"
A Arm	6"	8"	8"	9"
C Fixture	19"	24"	28"	33"
D Fixture	7"	10"	10"	10"

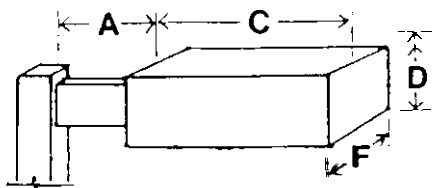
Note: Dimensions will vary from manufacturer to manufacturer. A variance of no more than 5% of these dimensions is permitted.

\* A tapered pole is preferred, but, if a tapered pole is unavailable, a straight pole may be used. Either all tapered or all straight poles must be used in an area; do not mix the two.



LIGHTING AND UTILITIES  
STREET AND PARKING LIGHTS

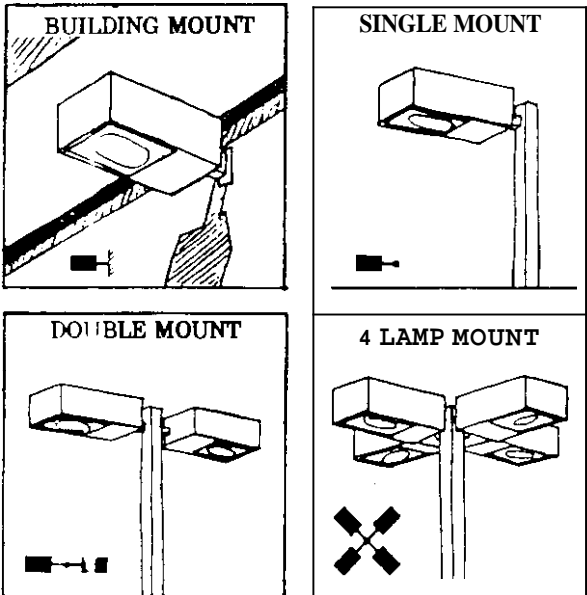
The standard cut-off or "shoebox" fixture is to be used on poles of varying heights and may be mounted directly on buildings. The size of the fixture is determined by the mounting height, see chart below.



Finish is to be standard brown baked enamel.  
Alt.-dark anodized bronze aluminum.

DIMENSIONS				
	12'	20'	25'	40'
Height				
Arm	6"	8"	8"	9"
Fixture	19"	24"	28"	33"
Fixture	7"	10"	10"	10"

MOUNTING OPTIONS



**Note:** Dimensions will vary from manufacturer to manufacturer. A variance of no more than 5% of these dimensions is permitted.

## LIGHTING AND UTILITIES

### STREET AND PARKING LIGHTS

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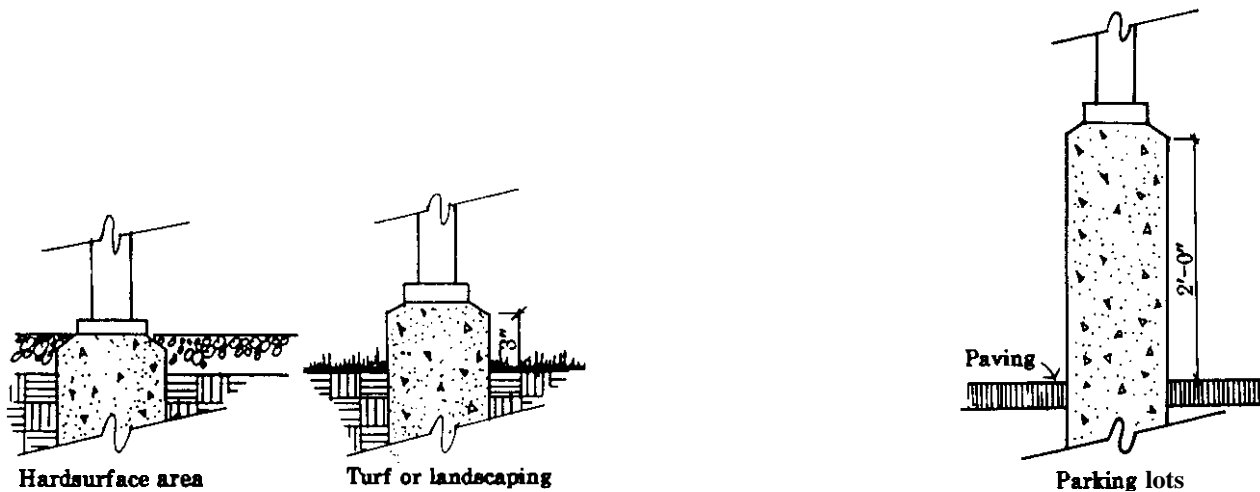
#### Light Poles

Metal Pole – Aluminum is preferred over painted steel because it requires less maintenance but it is more expensive. Either one may be used, but only one kind is to be used in any area.

The metal pole is to be the standard used on Post, except under the following conditions where wooden poles are acceptable.

Wooden Pole – This pole is to be a treated peeler pole with a dark brown transparent stain. It is to be used for utility lighting in low visibility areas in industrial and mission support areas. Ballfield and sport lights may also be mounted on wooden poles. The required height of the pole is determined by the mounting height of the fixture.

Poles are to be anchored as per manufacturer's specifications. Wooden pole footings are to be set on a bed of gravel for drainage. Metal pole base heights are shown below. The footing for a metal pole is to be natural unpainted concrete. Motorists invariably hit unprotected poles, therefore a two foot high concrete base is to be used for poles in parking areas that are not protected from cars by curbs or islands.



Typical pole anchoring



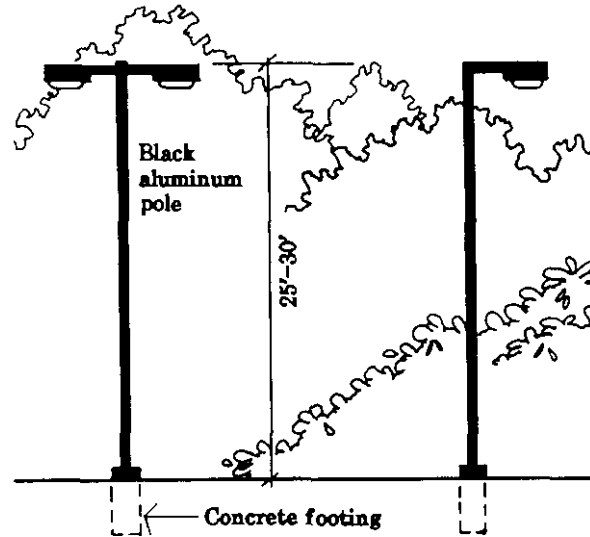
## LIGHTING AND UTILITIES

### PARKING LOT AND RECREATION LIGHTING

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#### Parking lot and Recreational Lighting

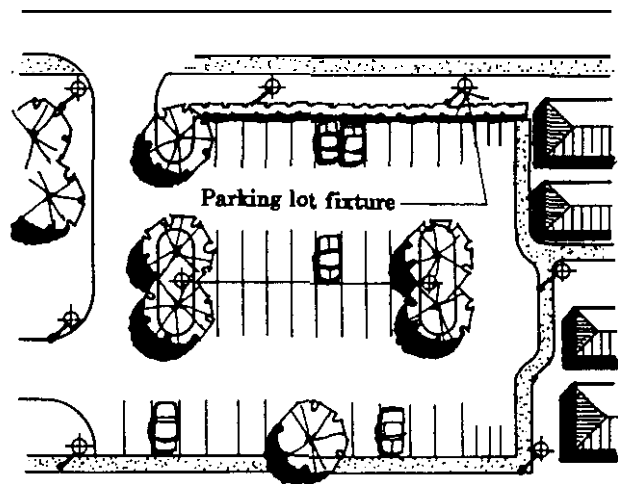
Large parking lots and recreational facilities with extended hours require lighting with a large light pattern. This reduces the total number of fixtures needed and provides even lighting throughout the area.



Parking lot and recreation lighting fixture

Recreational facilities requiring specialized lighting such as tennis courts and ball fields shall use the same light fixture as parking, regardless of the visual zone it is in.

When locating lighting around a parking lot, poles are to be located around the perimeter or in landscaped islands. Spacing and height shall follow manufacturers specifications for the required light.



Typical fixture placement



# LIGHTING AND UTILITIES

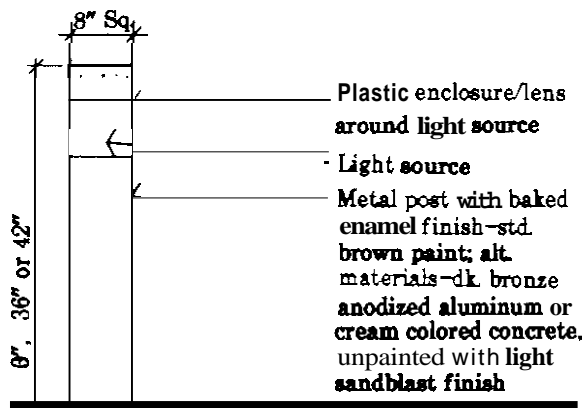
## PEDESTRIAN LIGHTS

### Bollards

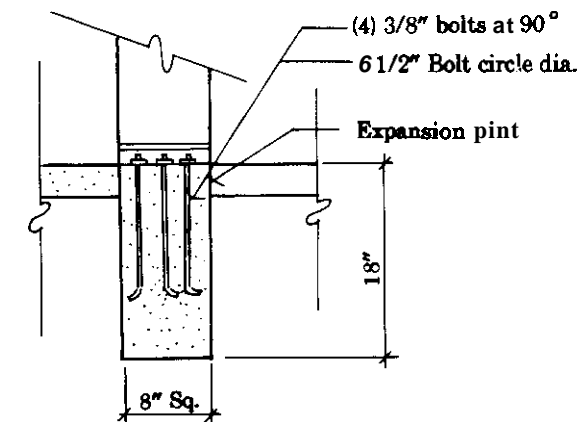
Lighted bollards will be used on special pedestrian walkway areas such as at stairs, ramps, or along secondary pathways that do not receive sufficient light from another sources. Plazas may require additional lighting that may best be supplied by the lighted bollard. The lighted bollard is characterized by low wattage requirements. Because lighted bollards in pedestrian areas are often subject to vandalism, special vandal-resistant tamper-proof screws and good quality lenses will be used. 'Lexan' lenses are recommended.

Bollard color will be uniform in any one area and will coordinate with other furnishings in the area. Bollard height is determined by the areas to be lighted. For instance, if a walkway is large, the bollard should be taller. If the walkway is narrow, the bollard should be shorter. Of course, the bollard should also be in scale with its surrounding elements.

The bollard should be bolted to a concrete base following manufacturer's recommendations.



**Bollard light**



**Typical mounting detail**



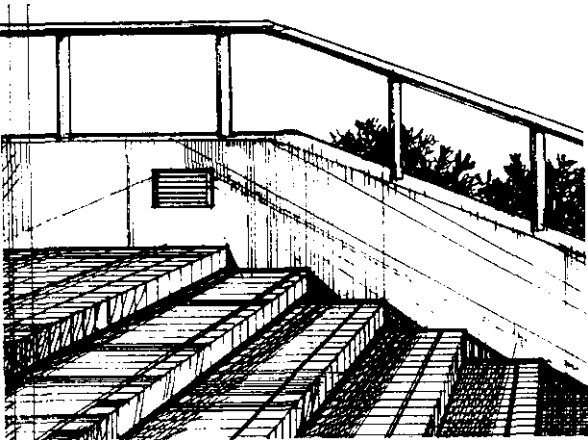


LIGHTING AND UTILITIES

PEDESTRIAN LIGHTS

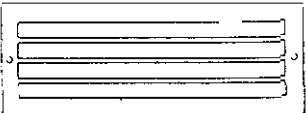
Wall Mounted Lighting

There are many types of wall mount fixtures. Some are very susceptible to vandalism. If these fixtures are used they should be high quality and vandal proof. The most likely use for these fixtures on Post are along ramps or stairs that are difficult to light from above. In some instances these lights are safer and create a more pleasing effect than would pole mounted fixtures or bollards.

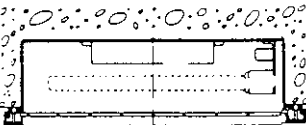


Wall mounted light at steps

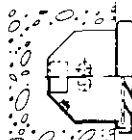
Louvers to direct light down



Front view



Top view



Side view

Recessed wall mounted light



## LIGHTING AND UTILITIES

### FIXTURES

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#### Illumination Levels

Illumination levels are determined by the amount of nighttime activity that will take place in an area. Primary streets should be lit brighter than secondary streets. Housing areas should be lit at the lowest level allowed for safety. Standards for foot-candle levels should be followed for the different use areas with allowances for special conditions.

#### Accent Lighting

Accent lighting shall be used to highlight architecturally significant buildings and facilities that will regularly be used in the evening. Accent lighting creates a more welcome atmosphere around a building. The light fixture shall typically be located either on the building or located in an area surrounding the building. The fixture must be waterproof and when located in the landscape, must be screened with vegetation or in a recessed area.



Typical accent lighting locations



## LIGHTING AND UTILITIES

### LOCATION & SPACING

The following locations and spacing are applicable for the Administrative, Community Facilities and Mission Support Zones:

LOCATION	LUMINAIRE TYPE	MOUNTING HEIGHT	POLE TYPE	SPACING	LAMP TYPE
Parking Lots Large > 40 Bays	CA	40'	M	120'	LPS, HPS, MV
Parking Lots Small ≤ 40 Bays	CD, CS	25'	M	90'	LPS, HPS, MV
Parkways/Highways	U	40'	M	120'	LPS, HPS
Primary/4 Lane/Divided	CD	40'	M	120'	LPS, HPS, MV
Primary/4 Lane/Undivided	CS	40'	M	120'	LPS, HPS, MV
Secondary/2 Lane	CS	25'	M	120'	HPS, MV
Tertiary/2 Lane/ Cul de Sac	CS	20'	M	120'	HPS, MV
Sidewalks	CS, B	15'	M, B	90'	MH, I
Ramps & Steps	CA, B, FW	Varies	M, B	Varies	MH, I
Plazas	CA, B	15'	M, B	Varies	MH, I
Building Entrances	—	—	—	—	MH, I
Signs	SP	Varies	—	—	MH, MV, I
Memorials & Monuments	SP	Varies	—	Varies	MH, MV, I
Building Display	SP, CB	Varies	—	Varies	MV, MH
Training Areas	U	*	M, W	Varies	HPS, MV
Storage Areas	U	*	M, W	Varies	HPS, MV
Service/Maintenance Areas	U, CB, CA	*	M, W	Varies	HPS, MV
Recreation	U	*	W	Varies	HPS, MV
Fence Perimeters	—	—	—	—	—
Airfield	CA, U, B	25'	M, W	Varies	HPS, MV

#### Luminaire Type:

CS - Cut off, single mount

CD - Cut off, double mount

CA - Cut off, single, double and 4 lamp mount

CB - Cut off, building mount

SP - spot

B - Bollard

U - Utility, styles vary

FW - Flush wall mount

#### Pole Type:

M - Metal

W - Wood

B - Bollard

#### Lamp Type:

HPS - High pressure sodium

MH - Metal halide

MV - Color corrected mercury vapor

I - Incandescent

#### Mounting Height:

\* - To be determined by type of fixture



## LIGHTING AND UTILITIES

### LOCATION & SPACING

The following locations and spacing are applicable for the Housing Zone.

LOCATION	LUMINAIRE TYPE	MOUNTING HEIGHT	POLE TYPE	SPACING	LAMP TYPE
Parking Lots Large > 40 Bays	CA	40'	M	120'	LPS, HPS, MV
Parking Lots Small ≤ 40 Bays	CD, CS	25'	M	90'	LPS, HPS, MV
Parkways/Highways	—	—	—	—	—
Primary/4 Lane/Undivided	CS	40'	M	120'	HPS, MV
Secondary/2 Lane	CS	25'	M	120'	HPS, MV
Tertiary/2 Lane/ Cul de Sac	CS	20'	M	120'	HPS, MV
Sidewalks	CS, B	15'	M, B	90'	MH, I
Ramps & Steps	CA, B, FW	Varies	M, B	Varies	MH, I
Plazas	CA, B	15'	M, B	Varies	MH, I
Building Entrances	—	—	—	—	—
Signs	SP	Varies	—	—	MV, I
Memorials & Monuments	SP	Varies	—	Varies	MH, MV, I
Building Display	—	—	—	—	—
Training Areas	—	—	—	—	—
Storage Areas	—	—	—	—	—
Service/Maintenance Areas	—	—	—	—	—
Recreation	U	*	W	Varies	HPS, MV
Fence Perimeters	—	—	—	—	—
Airfield	—	—	—	—	—

#### Luminaire Type:

CS - Cut off, single mount  
 CD - Cut off, double mount  
 CA - Cut off, single, double and 4 lamp mount  
 CB - Cut off, building mount  
 SP - spot  
 B - Bollard  
 U - Utility, styles vary  
 FW - Flush wall mount

#### Pole Type:

M - Metal  
 W - Wood  
 B - Bollard

#### Lamp Type:

HPS - High pressure sodium  
 MH - Metal halide  
 MV - Color corrected mercury vapor  
 I - Incandescent

#### Mounting Height:

\* - To be determined by **type** of fixture



## LIGHTING AND UTILITIES

### LOCATION & SPACING

LOCATION	LUMINAIRE TYPE	MOUNTING HEIGHT	POLE TYPE	SPACING	LAMP TYPE
Parking Lots Large > 40 Bays	U, CA	40'	W, M	120'	LPS, HPS, MV
Parking Lots Small ≤ 40 Bays	U, CD, CS	25'	W, M	90'	LPS, HPS, MV
Parkways/Highways	U	40	M	120'	LPS, HPS
Primary/4 Lane/Divided	CD	40'	M	120'	LPS, HPS, MV
Primary/4 Lane/Undivided	CS	40'	M	120'	LPS, HPS, MV
Secondary/2 Lane	CS	25'	M	120	HPS, MV
Tertiary/2 Lane/ Cul de Sac	CS	20'	M	120'	HPS, MV
Sidewalks	CS, B	15'	M, B	90'	MH, I
Ramps & Steps	CA, B, FW	Varies	M, B	Varies	MH, I
Plazas	CA, B	15'	M, B	Varies	MH, I
Building Entrances	U	Varies	—	—	MH, I
Signs	SP	Varies	—	—	MH, MV, I
Memorials & Monuments	SP	Varies	—	Varies	MH, MV, I
Building Display	—	—	—	—	—
Training Areas	—	—	—	—	—
Storage Areas	U	*	M, W	Varies	HPS
Service/Maintenance Areas	—	•	M, W	Varies	HPS
Recreation	U	*	W	Varies	HPS, MV
Fence Perimeters	U	*	W	Varies	HPS
Airfield	—	—	—	—	—

**Luminaire Type:**

CS - Cut off, single mount

CD - Cut off, double mount

CA - Cut off, single, double and 4 lamp mount

CB - Cut off, building mount

SP - spot

B - Bollard

U - Utility, styles vary

FW - Flush wall mount

**Pole Type:**

M - Metal

W - Wood

B - Bollard

**Lamp Type:**

HPS - High pressure sodium

MH - Metal halide

MV - Color corrected mercury vapor

I - Incandescent

**Mounting Height:**

\* - To be determined by type of fixture



## LIGHTING AND UTILITIES

### LOCATION & SPACING

LOCATION	LUMINAIRE TYPE	MOUNTING HEIGHT	POLE TYPE	SPACING	LAMP TYPE
Parking Lots Large > 40 Bays	CA	40'	M	120'	HPS, MV
Parking Lots Small ≤ 40 Bays	CD, CS	25'	M	90'	HPS, MV
Parkways/Highways	U	40'	M	120	HPS
Primary/4 Lane/Divided	CD	40'	M	120	HPS, MV
Primary/4 Lane/Undivided	CS	40'	M	120'	HPS, MV
Secondary/2 Lane	CS	25'	M	120'	HPS, MV
Tertiary/2 Lane/ Cul de Sac	CS	20'	M	120'	HPS, MV
Sidewalks	CS, B	15'	M, B	90'	MH, I
Ramps & Steps	CA, B, FW	Varies	M, B	Varies	MH, I
Plazas	CA, B	15'	M, B	Varies	MH, I
Building Entrances	—	—	—	—	—
Signs	SP	Varies	—	—	MH, MV, I
Memorials & Monuments	SP	Varies	—	Varies	MH, MV, I
Building Display	—	—	—	—	—
Training Areas	U	*	M, W	Varies	HPS, MV
Storage Areas	U	*	M, W	Varies	HPS, MV
Service/Maintenance Areas	U, CB, CA	*	M, W	Varies	HPS, MV
Recreation	U	*	W	Varies	HPS, MV
Fence Perimeters	CA, U	25'	M, W	90'	HPS, MH
Airfield	CA, U, B	25'	M, W	Varies	HPS, MH

**Luminaire Type:**

CS - Cut off, single mount

CD - Cut off, double mount

CA - Cut off, single, double and 4 lamp mount

CB - Cut off, building mount

SP - spot

B - Bollard

U - Utility, styles vary

FW - Flush wall mount

**Pole Type:**

M - Metal

W - Wood

B - Bollard

**Lamp Type:**

HPS - High pressure sodium

MH - Metal halide

MV - Color corrected mercury vapor

I - Incandescent

**Mounting Height:**

\* - To be determined by type of fixture



# LIGHTING AND UTILITIES

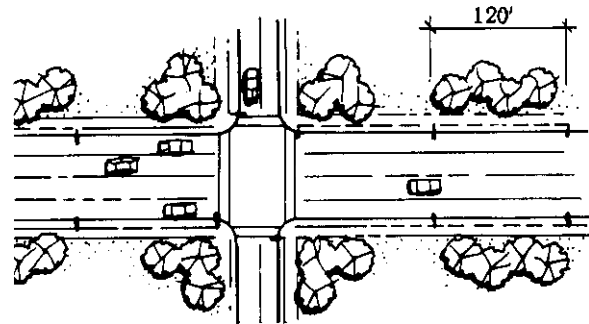
## LOCATION & SPACING

### Street Light Location

The placement of light poles along streets will be coordinated with street tree spacing so that light poles are centered between trees. Light poles will be placed a minimum of two feet back from the street curb. It is undesirable to locate poles in turf areas due to the increase in maintenance. Place poles in planted areas or in paved areas when possible.

### Single Mount Cut-Off Fixture, Paired On Both Sides of Street

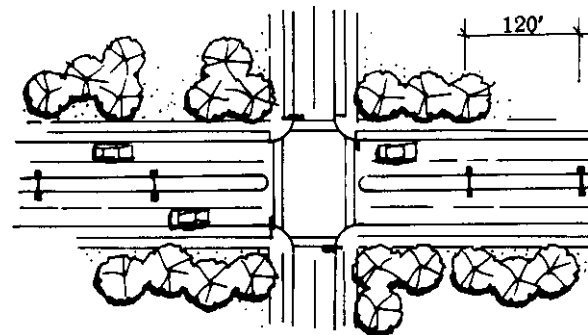
At these intersections, each corner will have a single mount pole anchored in sidewalk paving. Poles along the street will be placed in the planting strip between the street curb and sidewalk.



Primary 4 lane/undivided

### Double Mount Cut-Off Fixture, Down Center of Median

If the median is too wide for such an arrangement, two single mount poles may be used in pairs on either side of the median. Single mount lights will be used at each corner of the intersection.

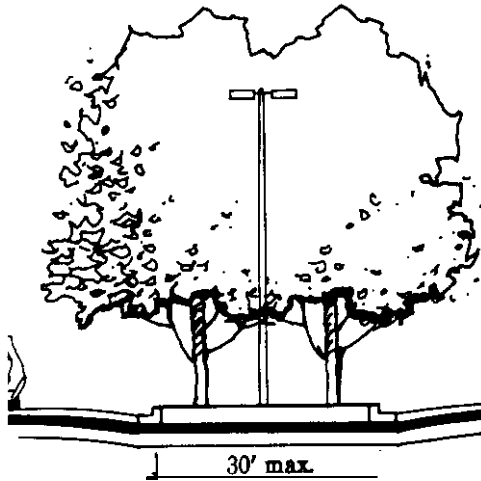


Primary 4 lane/divided

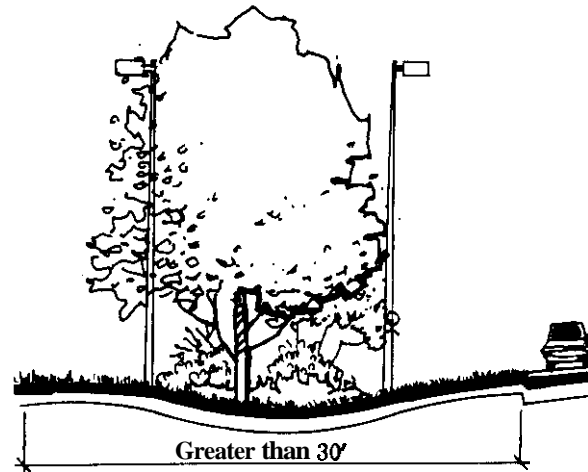


## LIGHTING AND UTILITIES

### LOCATION & SPACING



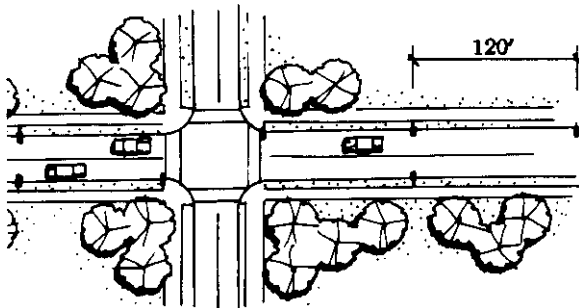
This  
(preferred)



or This

#### Single Mount Cut-Off Fixture, Paired On Both Sides

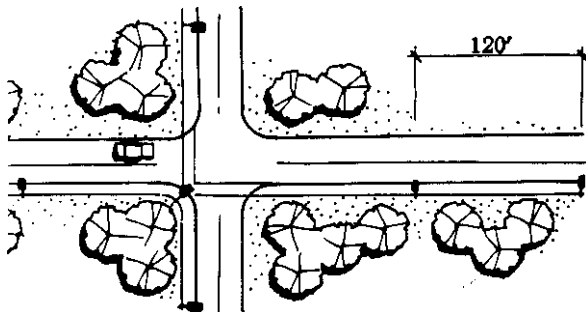
At this intersection, two corners will have single mount poles anchored in sidewalk paving. Along the street, poles will be placed in planting strip between street curb and sidewalk.



Secondary 2 lane

#### Single Mount Cut-Off Fixture, On One Side Of Street Only

If the street has a sidewalk, lights will be placed in paving flush against back edge of sidewalk. Crosswalks will be lit from a pole placed on one corner behind the walk.

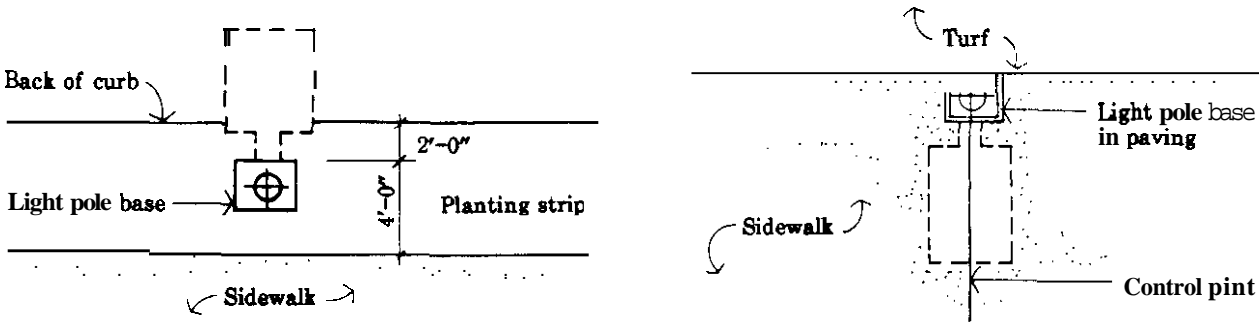


Tertiary 2 lane: cul-de-sac





**LIGHTING AND UTILITIES**  
**LOCATION & SPACING**



Location details



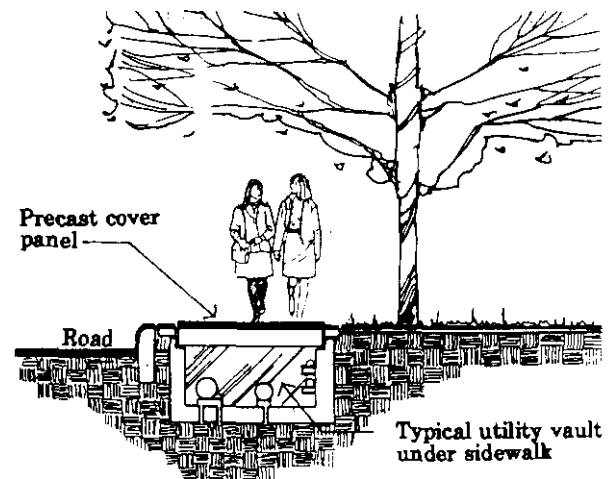
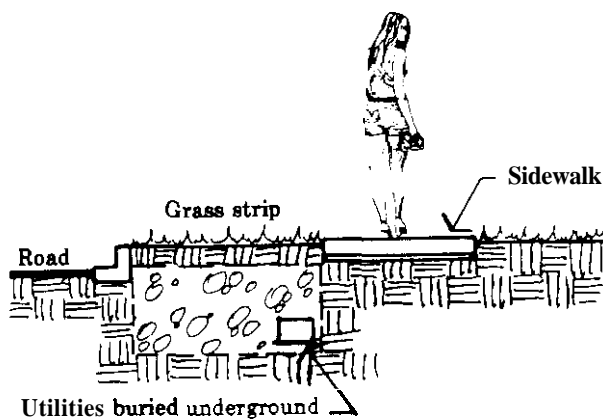
## LIGHTING AND UTILITIES

### UTILITY SITING

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#### Utility Siting

The utility infrastructure for Fort Jackson is to be placed underground whenever feasible. If a situation occurs where this is not possible or when some component of the infrastructure must be placed above ground, it is to be carefully located to lessen visual impact. Underground systems are to be placed in vaults directly under a paved surface or parallel to roads in the grassed buffer strip between the road and sidewalk. Do not use weep holes. Slope to a drain pit or pump out the ground water that may enter the trench and damage components.



#### Underground utility locations

Occasionally, underground lines must pass through a landscaped area. When this situation occurs, care must be taken to avoid routing lines inside the root areas (driplines) of trees. Trenching in the dripline of a tree is costly and damage to support and feeder roots will often kill the tree. Utility lines should be placed in areas where they will be covered by turf or groundcover areas that can be easily re-established.



# LIGHTING AND UTILITIES

## UTILITY SITING

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### Fire Hydrants

Fire hydrants that produce less than 500 G.P.M. or less are to be painted cream, Federal Standard 595a #33717. Hydrants that produce between 500-1,000 G.P.M.'s are to have a standard cream body and all nozzle caps will be dark brown, Federal Standard 595a #20095. Hydrants that produce more than 1,000 G.P.M. are to have a standard cream body but only the top cap is to be painted the standard dark brown. Sprinkle clear reflective beads on the caps after they have been lacquered with paint.

Add a blue reflector on the roadway on the side the hydrant is on.

Fire hazard symbols on buildings shall remain in accordance with NFPA 704. Facilities requiring symbols in accordance with NFPA 704 shall be visible from all adjacent roadways.

All fire department connector, OS&Y and Post indicator valves shall remain red.

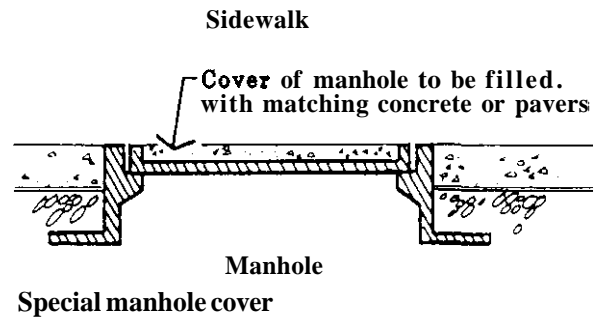
All hazardous materials shall be stored in accordance with NFPA 30.



## LIGHTING AND UTILITIES

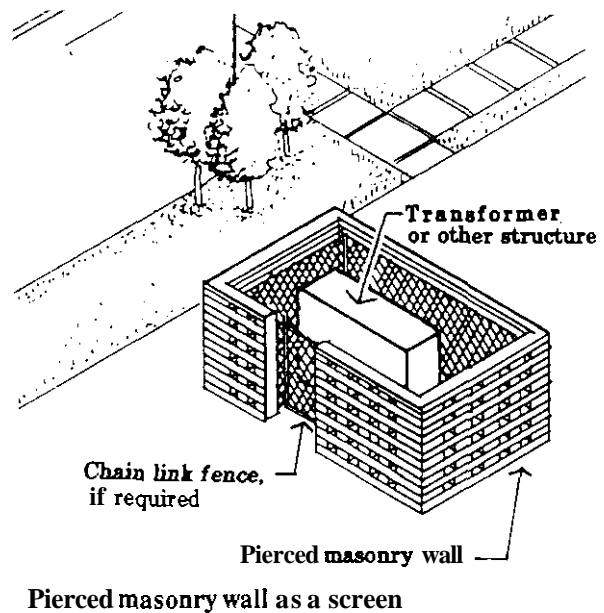
### UTILITY SITING

Underground utility access plates or man-holes are to be located in low visibility areas. They are to be set flush with the finished elevations and located in landscaped areas if possible. If it is necessary to locate a manhole in a sidewalk or paved pedestrian area, such as a plaza or a courtyard, the cover is to be of a special type that allows it to be paved in the same material as the adjacent area.



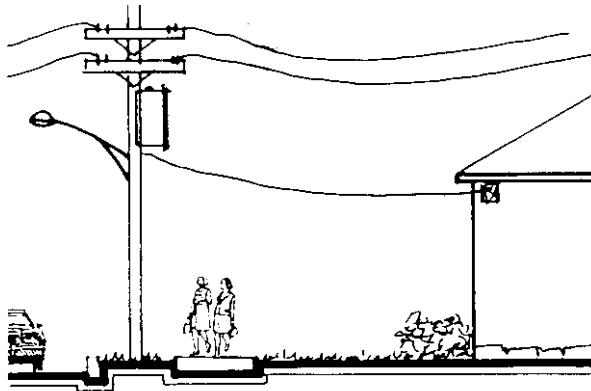
Breather pipes are to be painted dark green #14109 and located away from sidewalks, parking lots, and entrances to buildings, and major intersections. See Planting for appropriate vegetative screen. Every attempt is to be made to locate vents and structures in locations where their visual impact can be reduced or eliminated by incorporating them into the surrounding landscape. Do not put mechanical units on the roofs of buildings.

Existing structures that cannot be feasibly relocated to a less sensitive area are to be screened. A pierced masonry wall is an appropriate screening method for many utilities because it allows for adequate ventilation. It is recommended that such a wall in the manner appropriate for the visual zone in which a structure is located be used for screening. Other screening techniques include wood fencing, landscaping, or a combination of the two, depending upon the visual zone and degree of visibility. If a chain link fence is required by local code, whatever screening method is chosen can be constructed just outside of the fence.

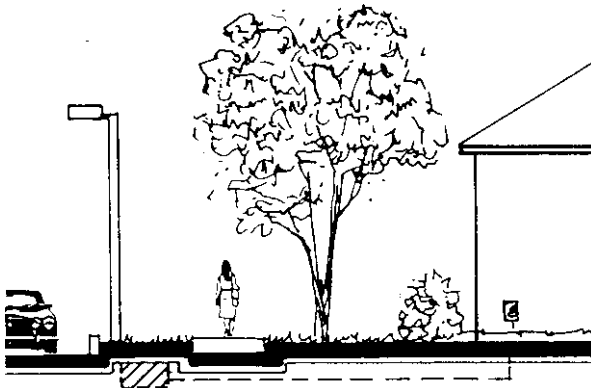


# LIGHTING AND UTILITIES

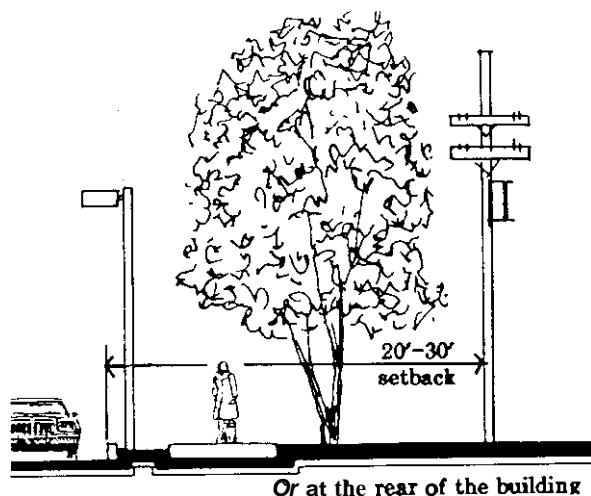
## UTILITY SITING



A - Not recommended



B - Preferred solution



C - Acceptable solution

### Locating Electric and Telephone Lines

Unsightly overhead utility lines greatly detract from the visual image of an area and are to be located underground wherever feasible. Whenever new facilities are planned or as relocation or renovation to existing lines provide the opportunity, underground placement should be considered. Although underground placement is more costly initially, the long term benefits of lower maintenance and a more pleasant visual environment often offset the difference in costs.

Three scenarios shown in the accompanying graphics depict various possible locations for overhead wires. The situation shown in "A" occurs in many locations throughout Fort Jackson. It is extremely unattractive and is discouraged except in non-visible areas of the Industrial Zone. The ideal solution is illustrated in "B". The lines are buried in the grass strip between the street curb and the sidewalks. Service lines to buildings are also buried, and meters and transformers are placed in low visibility locations. This solution minimizes conflict with street lights and street trees and improves the visibility of signs along the roadway.

Solution "C" is an acceptable alternative to "B" in areas that the lines can be "hidden" behind street trees or other buffers, or can be located to the rear of buildings.

Note: Do not plant trees under power lines or over surface lines. Power company to clear all tree pruning and cutting on Fort Jackson with the Director of Engineering and Housing, Master Planning Branch.

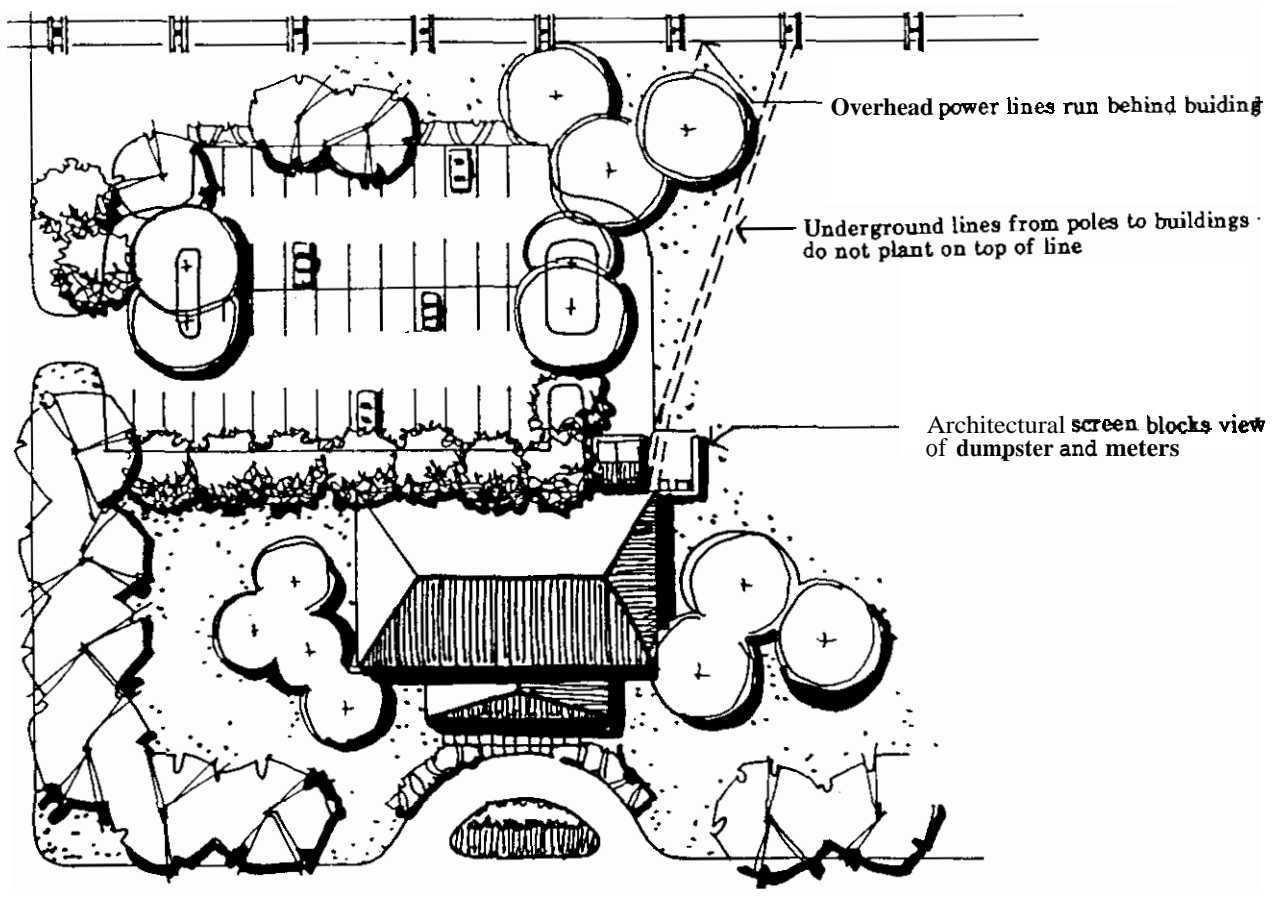


## LIGHTING AND UTILITIES

### UTILITY SITING

#### Communications Equipment

Communications equipment including telephone and Cable T.V. pedestals are to be located in areas of low visibility, if possible, such as rear or side yards of buildings. It is to be screened with architectural or landscape elements if such screening will not interfere with the operation of the equipment. Satellite communications equipment is to be similarly treated when sited at ground level. When roof mounted this equipment should be placed in the least conspicuous area possible and should be architecturally screened.



Rear building hook-ups



## LIGHTING AND UTILITIES

### GRATES AND INLETS

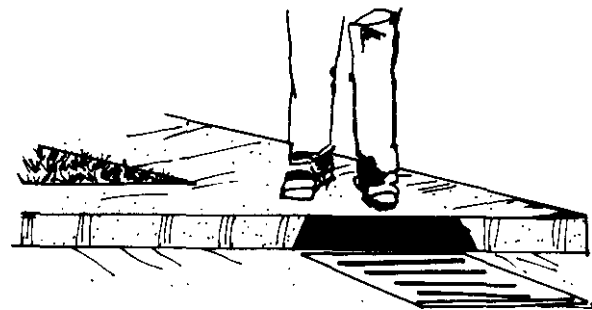
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#### Grates and Inlets

Any street with curbing will have an underground storm drainage system. The use of 'Dutch' or 'French' drains is encouraged.



Position drainage grates out of pedestrian paths. *Also* check width of openings as a safety precaution to prevent injury to pedestrians or cyclists.



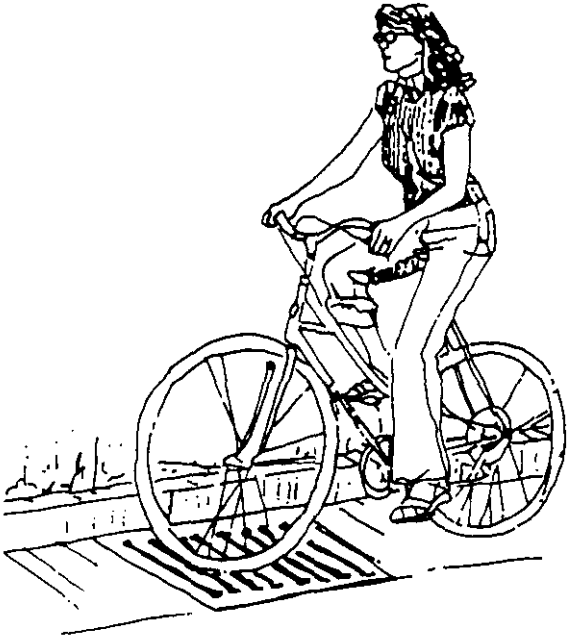
In areas where streets are not curbed, grassed drainage swales compatibly contoured into the natural landform are to be the storm drainage system.



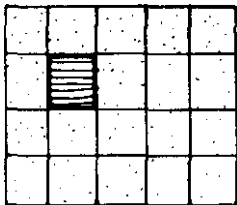
LIGHTING AND UTILITIES

GRATES AND INLETS

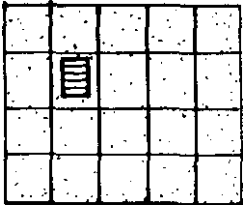
The size, placement, and spacing of drain inlets should be considered *so* that these elements do not detract from the overall design. Drain inlets should be worked into the paving pattern whenever possible. Grate inlets will not present a hazard to foot or bike traffic.



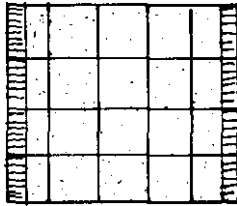
Drain slots perpendicular to the curb



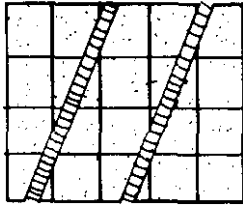
Acceptable - square drain



Not recommended - square drain



Prefered - trench drain



Not recommended - trench drain

Drain paving coordination



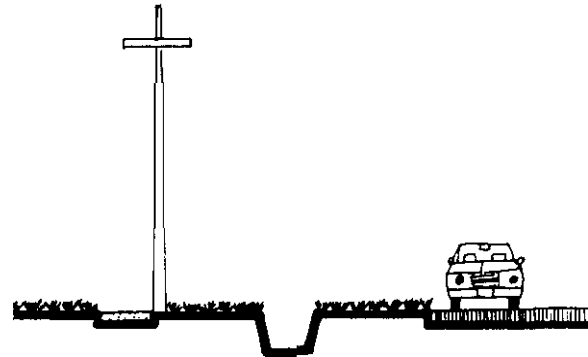


# LIGHTING AND UTILITIES

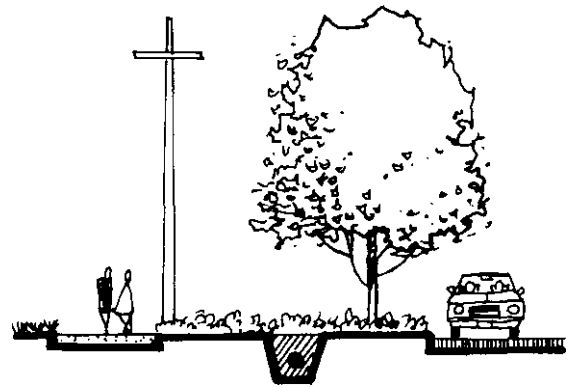
## SWALES AND CHANNELS

### Swales and Channels

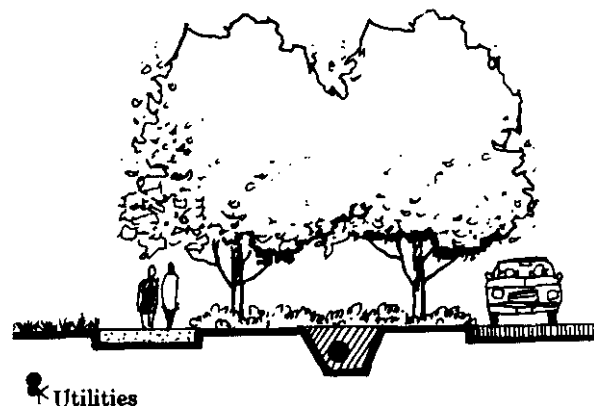
**Existing.** Although there are not a lot of open drainage channels at Fort Jackson, the existing ones have severe erosion problems. These open ditches require recurrent and costly maintenance.



**Improvement.** Storm drainage is piped underground. Sidewalk widened and street trees give spatial definition to street.



**Ideal.** Sidewalk is enlarged to appropriate 10' width. Storm drainage has been piped underground. Utilities have been put underground also, on opposite side of sidewalk from trees.

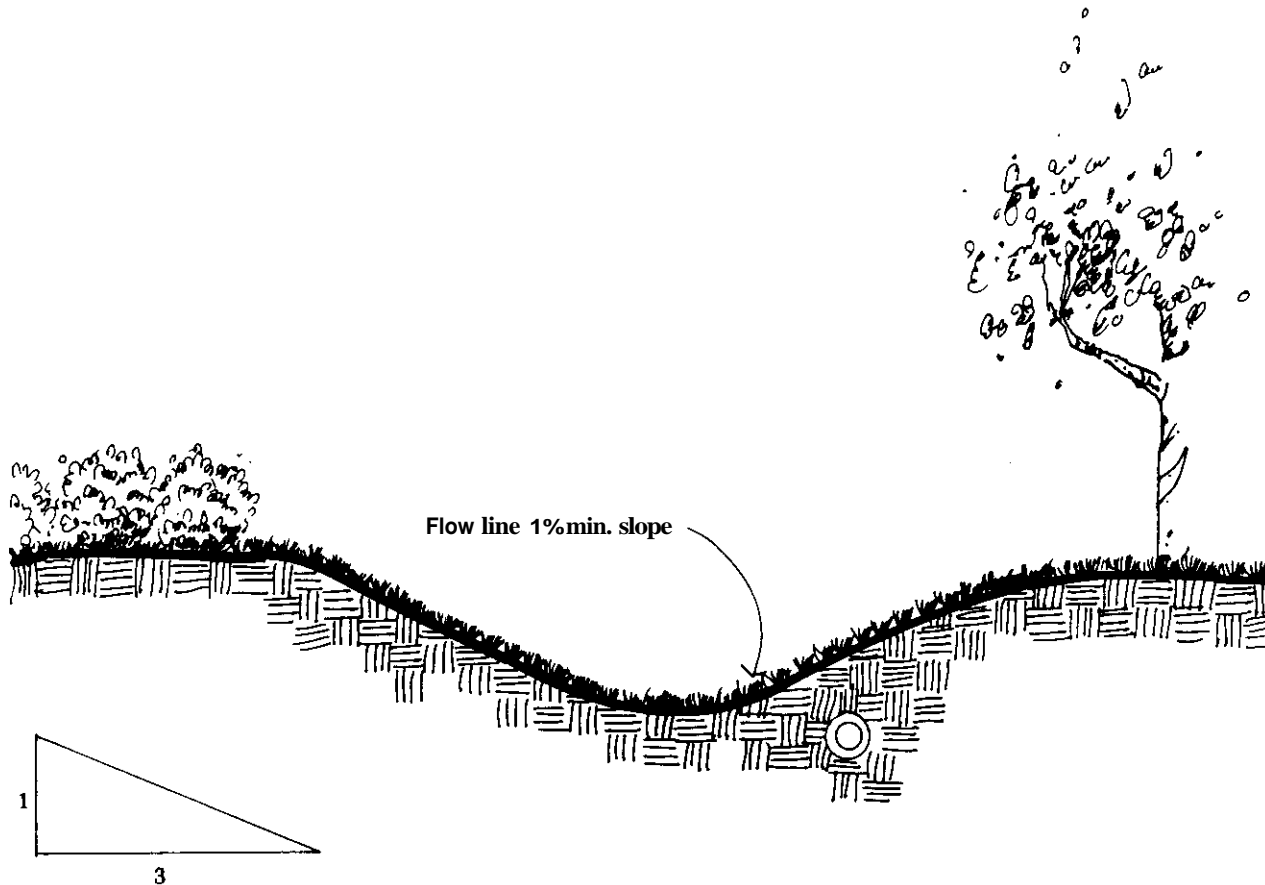


## LIGHTING AND UTILITIES

### SWALES AND CHANNELS

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Swales should be designed with a maximum slope of 3:1 to allow easy access for maintenance and repair vehicles. The flow line of the swale should be a minimum of a 1% slope.



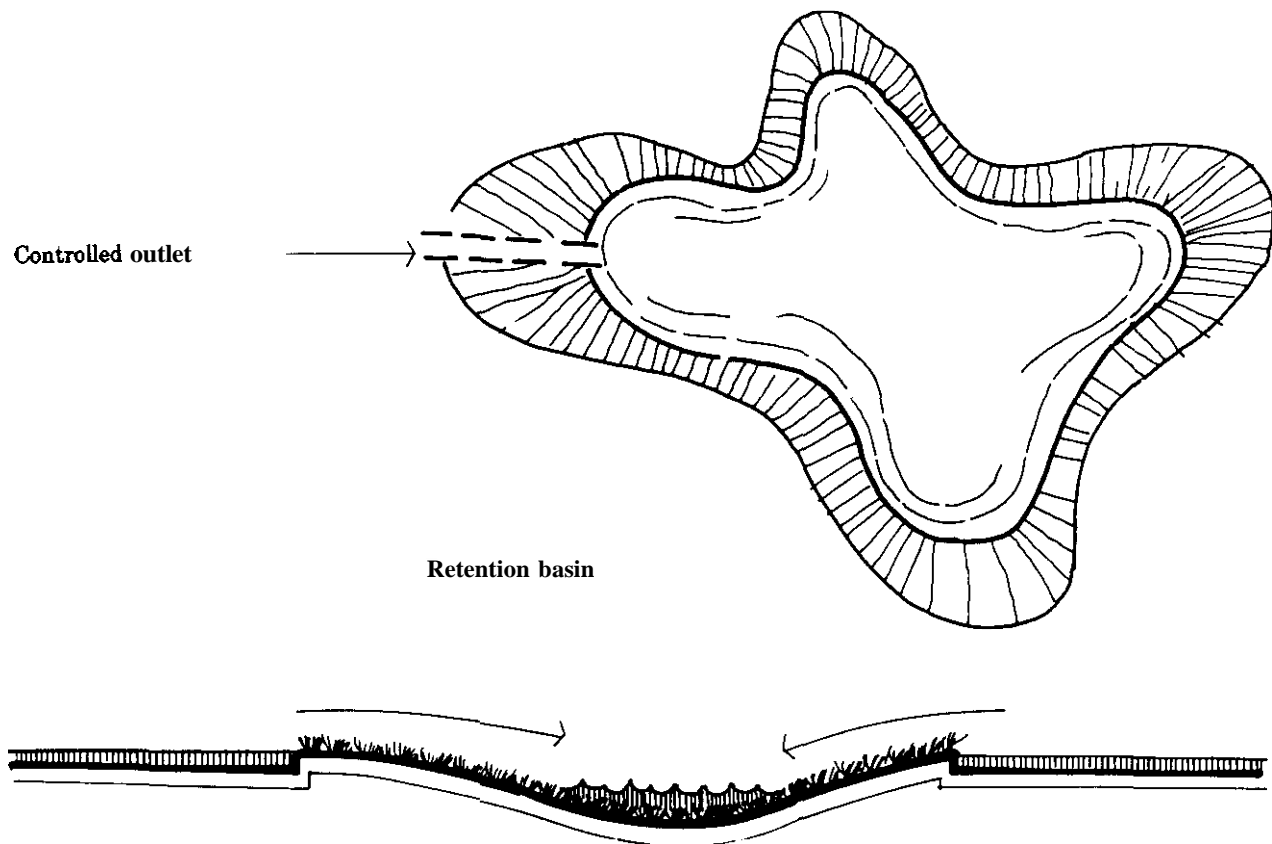
## LIGHTING AND UTILITIES

### RETENTION BASINS

---

#### Retention Basins

Each project should be designed so that the surface water leaving the site after the project is complete is not significantly greater than that leaving prior to development of the site. Retention ponds or basins collect storm water runoff and then release it slowly over a period of time so the ground may absorb the water more thoroughly. These basins are to be designed so that during normal or dry stages these areas may be used for other purposes or at least be visually unoffensive; therefore these structures should be planted in grass. To insure a good grass stand, the basin must be carefully graded to insure uniform surface drainage. The retention basin may be used for sediment control. If sedimentation is a major problem, sediment traps are to be installed.



Road medians may be used for temporary storage of water.



# LIGHTING AND UTILITIES

## UTILITY STRUCTURES

### Utility Structures

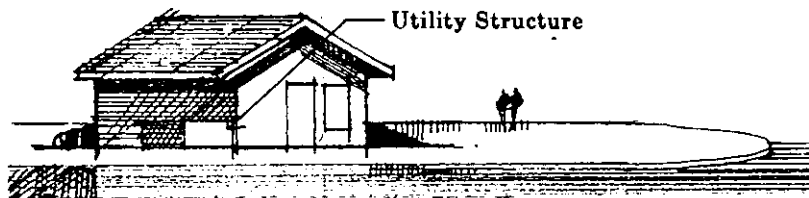
Utility systems on Post are essential. At Fort Jackson these systems generally align with the road network and are highly visible. Above ground utility structures will not be located in visually prominent locations. When siting these structures the designer will make use of plant material, topography and/or architectural walls or screens to mitigate these structure's impact on their environment.

The amount of screening these structures receive will vary from little to none in the Industrial Zone to very well screened in the Administrative Zones. All utility structures on Post that are not architecturally treated (such as brick pump houses) are to be painted a dark brown so they will recede into their environment. Every attempt should be made to locate vents and structures in areas that can be incorporated into the surrounding grounds.

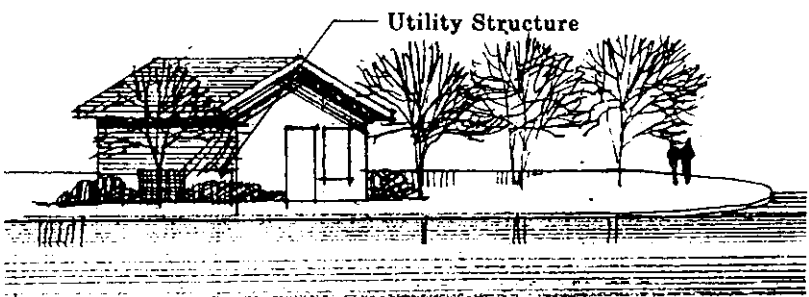
Utility structure on the corner is very visible. It detracts from the building.



Simply placing the structure near the building improves the visual environment and the streetscape.



Landscaping essentially hides the structure and creates a pleasant streetscape



Above ground utility siting



## LIGHTING AND UTILITIES

### UTILITY STRUCTURES

#### Screening

When siting structures located above ground such as meters and transformers, the designer is to make use of plant material, topography and/or architectural walls or screens to mitigate the structure's visual impact. Every attempt should be made to locate vents and structures in unobtrusive ways from intersections and major facilities.

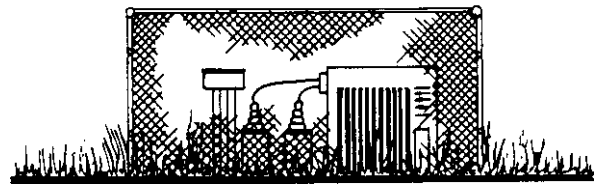
**Do this...** Trees used to soften the visual impact of poles and wires



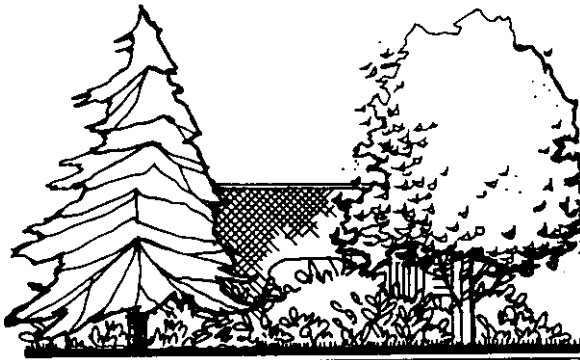
**Not this.**



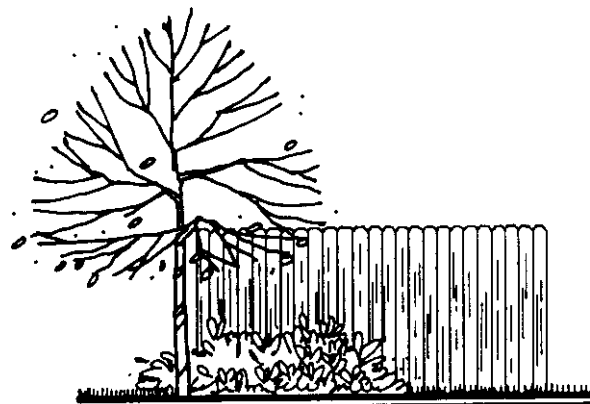
Trees used to hide utility line



Unscreened structure



Vegetation only



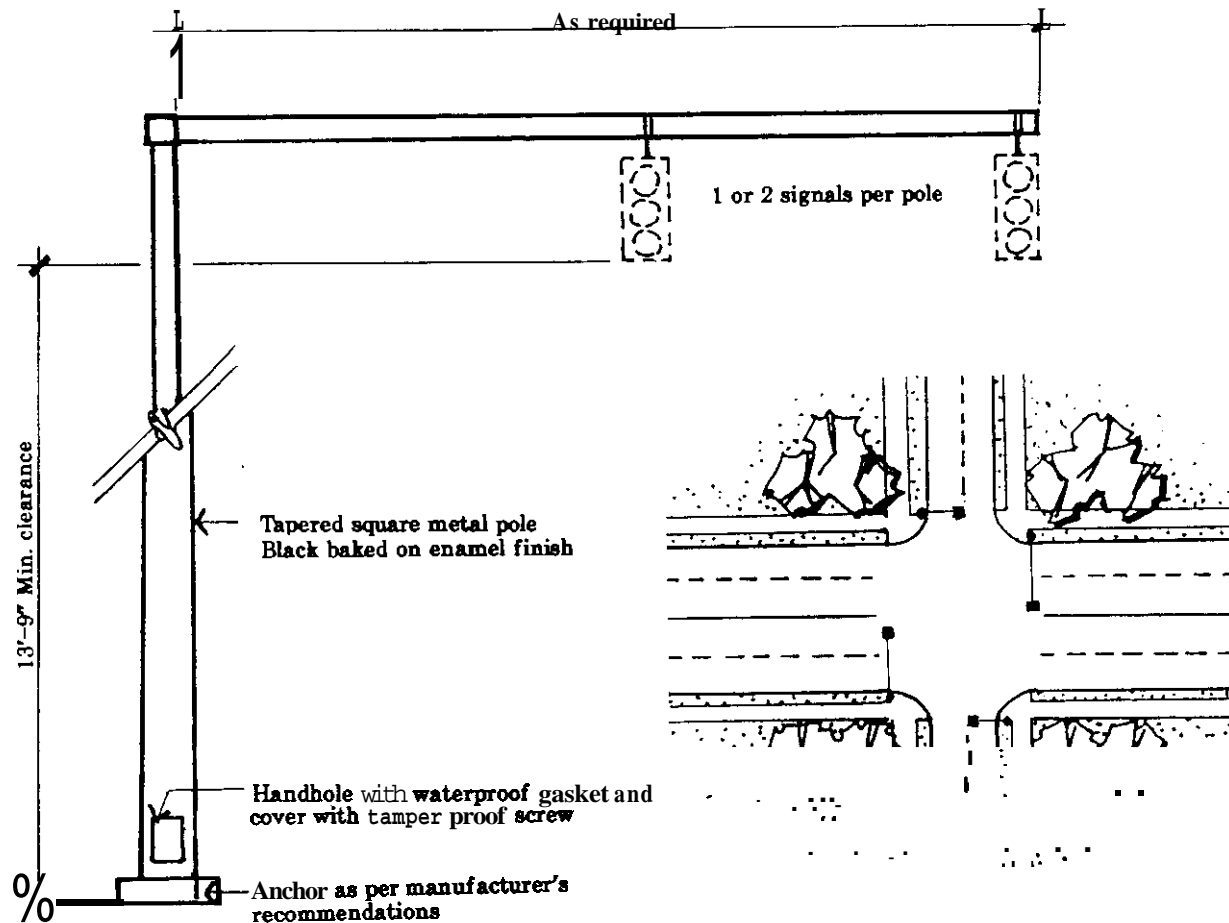
Vegetation and fence or wall

## LIGHTING AND UTILITIES

### TRAFFIC SIGNALS

#### Traffic Signals

This traffic light pole is the only one allowed in the Administrative and Community Facilities areas. It will also be used in all areas where the utilities are buried underground. At intersections with traffic signals, this pole will be used instead of the standard light pole. The standard cut off luminaire fixture will be mounted at the correct height on each pole. Pole will be placed flush against edge of sidewalk furthest from the street. All poles must be placed a minimum of two feet back from street curb. Poles should not be placed in middle of sidewalk or in turf areas. Place poles in planted areas or at edge of paved areas only. Pole will be of sufficient size and strength to support needed traffic signals without being guyed or staked.



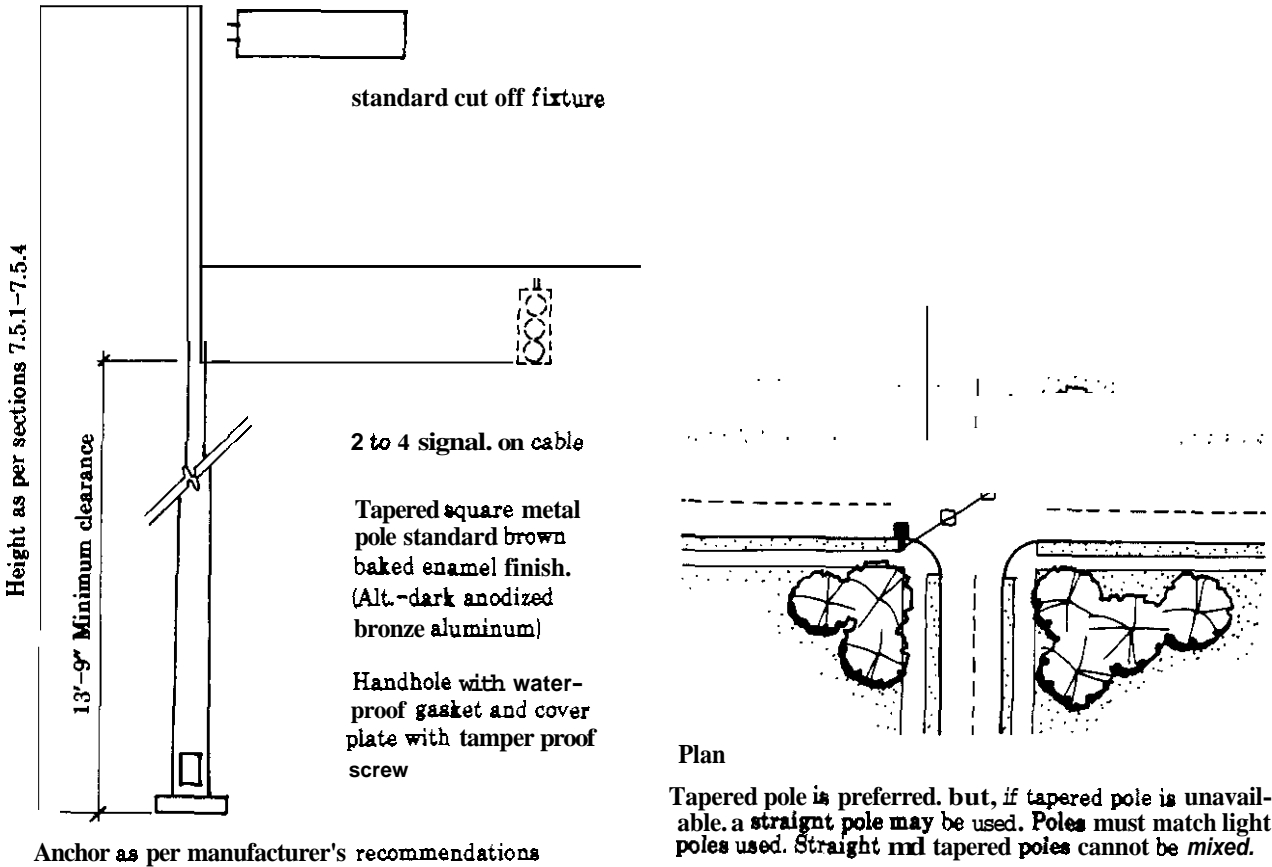
Mast arm traffic signal and light pole



LIGHTING AND UTILITIES

TRAFFIC SIGNALS

This pole will be used to support traffic signal cables at all intersections wherever utilities are above ground except in Administration and Community Facilities areas. Poles will be of sufficient size and strength to support the needed traffic signals without being guyed or staked. Two poles will be used at each intersection at opposite corners. Pole will be topped with a standard cut off luminaire fixture. A cable will be stretched between the two poles and the necessary traffic signal fixtures will be hung from this cable. Regular light poles with the standard cut of luminaire fixture will be used on the other two corners. All poles will be placed at least two feet back from street curb. Poles should not be placed in middle of sidewalk or in turf areas. Place poles in planted areas or at edge of paved areas only.



Strain pole

## LIGHTING AND UTILITIES

### ENVIRONMENTAL CONSIDERATIONS

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#### SCDHEC Permit

All new work shall conform to the Environmental Section South Carolina EPA (see SCDHEC permit below). New work shall include: water lines, sewer lines, septic tanks, latrines, vaults, irrigation systems, and water wells. Water wells require 3 types of permits: test well, equipment installation, and operation. All systems below ground shall be inspected by SCDHEC before applying groundcover.

#### SCDHEC Permit

1. Construction Permit:

The contractor shall submit the utility design, plans and specifications to the State Department of Health and Environmental Control for approval. The submittal will be signed by DEH and will have a South Carolina Registered Professional Engineers Stamp affixed. A digging permit shall be obtained from DEH.

2. Operating Permit:

The contractor is also required to certify to the State Department of Health and Environmental Control that the construction is in accordance with the approved plans and specifications. All equipment will be installed using good engineering practices and will have a South Carolina registered professional engineer's stamp affixed.





## **LIGHTING AND UTILITIES**

### **ENVIRONMENTAL CONSIDERATIONS**

---

#### Design Objectives

- Reclaimed oil tanks may be placed underground and must comply with Federal, State, and Army regulations and be registered with SCDHEC.
- Oil and water separators shall be designed to receive run-off from wash rack and shall have curb and cover to keep stormwater out.
- Environmental documentation shall be prepared for each project in accordance with Army Regulation **200-2**, Environmental Effects of Army Actions.
- All electrical transformers installed shall be certified PCB free.
- All equipment and building material installed shall be asbestos free.
- All plumbing joints and water fountains shall use only lead-free solder.
- The use of lead base paint is prohibited.
- Coordination with the Fish and Wildlife Branch must occur to determine potential impacts on endangered species.
- All pesticides must be stored in one building.



# INSTALLATION DESIGN GUIDELINES

## COLOR INDEX

### Buildings & Courtyards



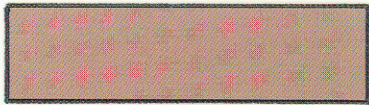
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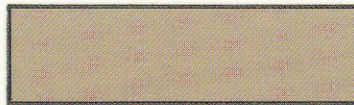
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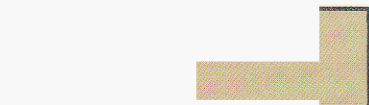
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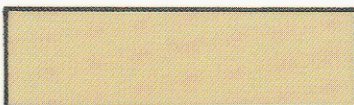
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23578



23717



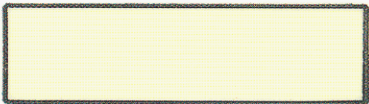
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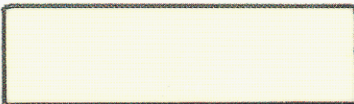
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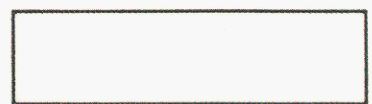
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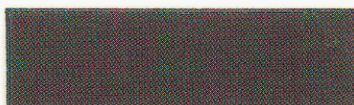
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### Site Furnishings



10049



20059



33719

### Signage



\*11105/21105



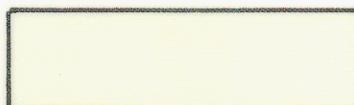
\*14109/24108



15090



\*17038/27038



\*17875/27875



30099

\*Gloss/Semi-Gloss



# ENVIRONMENTAL CONSIDERATIONS

## GENERAL INFORMATION

---

### SCDHEC Permit

All new work shall conform to the Environmental Section South Carolina (see SCDHEC permit below). New work shall include: water lines, sewer lines, septic tanks, latrines, vaults, irrigation systems, and water wells. Water wells require 3 types of permits: test well, equipment installation, and operation. All systems below ground shall be inspected by SCDHEC before applying groundcover.

### SCDHEC Permit

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The contractor is also required to certify to the State Department of Health and Environmental Control that the construction is in accordance with the approved plans and specifications. All equipment will be installed using good engineering practices and will have a South Carolina registered professional engineer's stamp affixed.



## ENVIRONMENTAL CONSIDERATIONS

### GENERAL INFORMATION

---

#### Design Objectives

- Reclaimed oil tanks may be placed underground and must comply with Federal, State, and Army regulations and be registered with SCDHEC.
- Oil and water separators shall be designed to receive run-off from wash rack and shall have curb and cover to keep stormwater out.
- Environmental documentation shall be prepared for each project in accordance with Army Regulation 200-2, Environmental Effects of Army Actions.
- All electrical transformers installed shall be asbestos free.
- All plumbing joints and water fountains shall use only lead-free solder.
- The use of lead base paint is prohibited.
- Coordination with the Fish and Wildlife Branch must occur to determine potential impacts on endangered species.
- All pesticides must be stored in one building.



# APPENDIX

## EE

# U.S. Army Training Center and Fort Jackson



## FTJA 34 UST Site #1 Annual Long Term Monitoring Report

Permit Numbers 15597 and 15598

U.S. Army Training Center and  
Fort Jackson, South Carolina

October 26, 2005



**FTJA 34 UST Site #1  
Annual Long Term  
Monitoring Report**

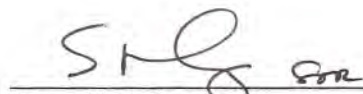
U.S. Army Training Center  
and Fort Jackson, South  
Carolina

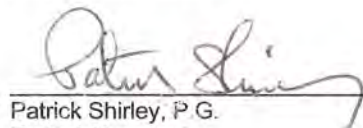
Prepared for:  
U.S. Army Training Center

Prepared by:  
ARCADIS G&M, Inc.  
420 Park Avenue, Suite 100  
Greenville  
South Carolina, 29601  
Tel 864 242 1717  
Fax 864 235 9062

Our Ref.:  
GS028567.0CMS.GS012

  
\_\_\_\_\_  
Jennifer Dottorelli  
Staff Scientist

  
\_\_\_\_\_  
James M. Bedessem  
Principal Engineer

  
\_\_\_\_\_  
Patrick Shirley, P.G.  
Project Manager

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ARCADIS

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Fort Jackson

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**ARCADIS**

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- B 1997 Phase II Investigation Plume Maps
- C 1999 Phase III Investigation Plume Maps
- D 2004 LTM Plume Maps
- E Laboratory Reports
- F Data Validation Reports

**ARCADIS****Acronyms**

U.S. Army Training Center and  
Fort Jackson

**Acronyms**

ARCADIS	ARCADIS G&M, Inc.
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAP	Corrective Action Plan
DO	Dissolved Oxygen
E&E	Ecology and Environment, Inc.
ETI	Environmental Technology of North America, Inc.
Fort Jackson	United States Army Training Center and Fort Jackson
ft bgs	Feet below ground surface
IDW	Investigation Derived Waste
LTM	Long Term Monitoring
MNA	Monitored Natural Attenuation
ORP	Oxygen Reduction Potential
PAH	Polynuclear Aromatic Hydrocarbon
PBC	Performance Based Contract
PPE	Personal Protective Equipment
RBSL	Risk-Based Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
SVOCs	Semi-Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbon
µg/L	Micrograms per liter
USAEC	United States Army Environmental Center
USATC	United States Army Training Center
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

**ARCADIS****FTJA 34 UST Site #1  
Annual Long Term  
Monitoring Report**U.S. Army Training Center  
and Fort Jackson**1.0 Introduction**

ARCADIS G&M, Inc. (ARCADIS) has been retained by the United States Army Environmental Center (USAEC) to perform Long Term Monitoring (LTM) activities in accordance with the requirements of the Performance Based Contract (PBC) order number DACA21-02-D-0005 at United States Army Training Center (USATC) and Fort Jackson (Fort Jackson) located in Columbia, South Carolina (Figure 1-1). This report presents the findings of the 2005 annual LTM program for underground storage tank (UST) Site #1 (Permit Numbers 15597 and 15598) located within the Cantonment Area, at the southeast corner of the intersection of Washington Street and Hall Street in Fort Jackson, South Carolina (Figure 1-2).

**1.1 Site Background**

UST Site #1 consists of two former UST facilities. One of the facilities consisted of Areas A and B, located near former Building 1545, and Area C, located near former Building 1565. The other UST facility was located near former Building 1550. Areas A, B, and C contained a combined total of 15 USTs. Area A contained two 12,000-gallon steel USTs and one 10,000-gallon steel UST and Area B contained ten 12,000-gallon steel USTs.

Area A and B served former Building 1545 which was used as a fuel-dispensing location with several fuel service islands located southeast of the building. Gasoline, fuel oil, and “solvent” were stored in ten of the 12,000-gallon USTs within Areas A and B. Records did not indicate the type of solvent stored, the contents of the other two 12,000-gallon USTs, or the contents of the one 10,000-gallon UST. Area C, which serviced former Building 1565, contained two 5,000-gallon USTs that were used to store gasoline, fuel oil, and diesel fuel.

Former Building 1550, was located in the southwest corner of the site. An empty 500-gallon above ground storage tank was formerly located on the north side of the building.

The UST system was taken out of service in 1984. Due to the shallow water table in the area, the USTs were filled with water to prevent buoyancy issues. Records indicate an undocumented amount of product removed from the USTs spilled on the ground during water-filling activities.



**FTJA 34 UST Site #1  
Annual Long Term  
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All of the USTs have since been drained and removed from the Site. The excavated areas were backfilled with the excavated soils. In addition, the excavation areas from the removal of the two USTs in Area C were lined with plastic sheeting before the excavated soils were returned. The area is currently a relatively flat grassy lot with broken asphalt in the northeast corner of the Site and an asphalt parking lot located in the southeast corner of the Site.

Long term monitoring activities are on-going to assess the effectiveness of natural attenuation in reducing groundwater concentrations below South Carolina Risk Based Screening Levels (RBSLs) and the Site Specific Target Levels (SSTLs). SSTLs were developed for benzene using site specific geologic characteristics and the Domenico Model. SSTLs for toluene, ethylbenzene, xylenes, and naphthalene were set at Henry's Law solubility limits (SDHEC, 2002). This report presents an evaluation of the data collected during the LTM event conducted in August 2005.

## **1.2 LTM Scope and Objectives**

The objectives of the LTM include the following:

- Collect groundwater samples from 14 existing monitoring wells;
- Evaluate groundwater data to determine the effectiveness of natural attenuation in reducing groundwater concentrations below RBSLs; and
- If necessary, recommend further corrective actions for the Site.

## **1.3 Report Organization**

This report contains six sections, including the introduction:

- Section 2: Previous Investigations – Provides a brief summary of previous investigations and remedial actions completed at the Site;
- Section 3: Long Term Monitoring Activities – Summarizes the activities completed during the August 2005 annual LTM event;
- Section 4: Data Evaluation – Presents a summary and an evaluation of the analytical results from the data collected during the August 2005 annual LTM event;

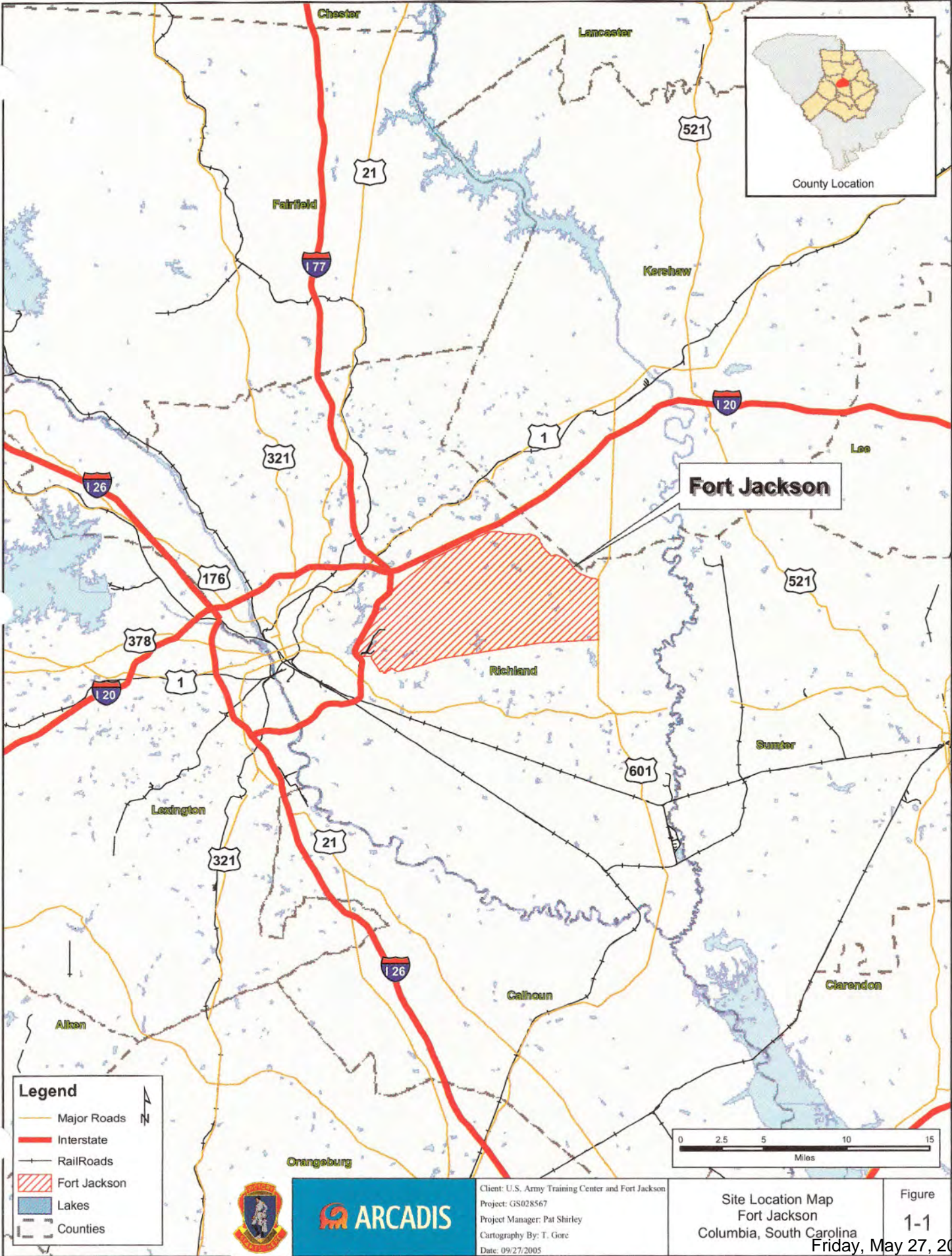


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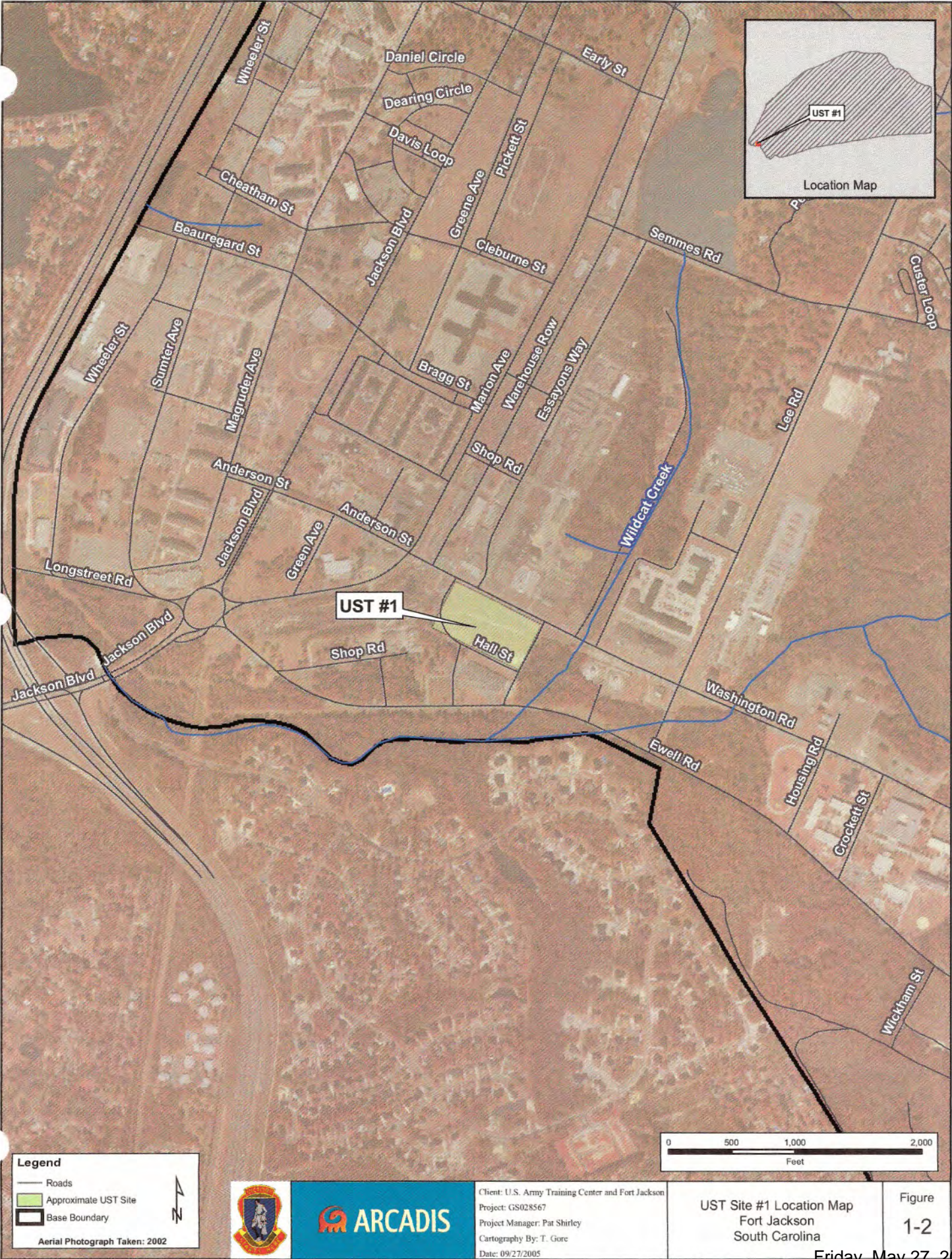
**FTJA 34 UST Site #1  
Annual Long Term  
Monitoring Report**

U.S. Army Training Center  
and Fort Jackson

- Section 5: Conclusions and Recommendations – Presents the conclusions of the annual monitoring event and, if necessary, recommends future remedial activities; and
- Section 6: References – Provides a list of references utilized in this report.











**FTJA 34 UST Site #1  
Annual Long Term  
Monitoring Report**

U.S. Army Training Center  
and Fort Jackson

## **2.0 Previous Investigations**

Following removal of the USTs, several investigations were performed to determine the extent of contamination. A brief summary of the previous investigations are provided below.

### **2.1 Preliminary Investigation**

During the removal of the UST system in 1992, a total of 32 soil samples and three groundwater samples were collected from the excavation areas by Environmental Technology of North America, Inc. (ETI). Toluene, ethylbenzene, xylenes, naphthalene, and total petroleum hydrocarbon (TPH) were detected in several soil and groundwater samples collected in Areas A and B.

Following UST removal, Ebasco conducted a preliminary investigation of Area C in 1992. Three shallow monitoring wells (QMW14, QMW15, and QMW16) were installed along the perimeter of the area. During well installation, both soil and groundwater were sampled. All three wells were screened from 5 to 15 feet below ground surface (ft bgs) with the water table occurring at approximately 4 ft bgs. Analytical results indicated TPH in all soil samples and benzene, toluene, ethylbenzene, and xylene (BTEX) in one soil sample. BTEX was detected in all three groundwater samples (Ebasco, 1992).

### **2.2 Phase I Investigation**

During May, June, and August of 1995, E&E conducted an investigation to delineate the extent of soil and groundwater contamination at the Site. Eleven (11) shallow groundwater monitoring wells (QMW1 through QMW10 and QMW17) and three intermediate depth groundwater monitoring wells (QMW11-I, QMW12-I, and QMW13-I) were installed as part of the investigation. Soil samples were also collected from each of the monitoring wells during installation and 16 soil borings were installed at depths up to 6 ft bgs at various locations throughout the Site.

Analytical results for both soil and groundwater showed elevated concentrations above RBSLs for ethylbenzene, xylenes, and PAHs at several locations. Groundwater concentrations were above the RBSL for benzene of 5 micrograms per liter ( $\mu\text{g/L}$ ) in four monitoring wells (QMW3, QMW4, QMW14, and QMW16) and the RBSL for Total PAHs (25  $\mu\text{g/L}$ ) in five wells (QMW1, QMW3, QMW5, QMW14, and



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QMW16) (E&E, 1995). Plume concentration maps are included in Appendix A (E&E, 1995).

**2.3 Phase II Investigation**

E&E conducted a second investigation in January of 1997 to further delineate soil and groundwater contamination at UST Site #1. As part of the investigation, five shallow groundwater monitoring wells were installed and subsequently sampled and analyzed (QMW18 through QMW22). Soil samples were collected from the five monitoring well borings and from three additional locations.

Soil analyses showed concentrations exceeded the total PAH RBSL (25 µg/L) in one sample (QSB18 – 0-2'). RBSL exceedances were reported in groundwater in the 1995 investigation. The five groundwater samples collected from monitoring wells installed as part of this investigation were all below RBSLs with the exception of QMW18 (2-4') for total PAHs (E&E, 1997). Plume concentration maps are included in Appendix B.

**2.4 Phase III Investigation**

Two additional groundwater monitoring wells (QMW22A and QMW23) were installed in March 1999 as part of the third Site investigation conducted by E&E. Groundwater samples were collected from both monitoring wells on March 4-5, 1999 and September 7-9, 1999. During both events several wells exceeded the RBSL for total lead of 0.015 µg/L (unfiltered). Analytical results showed RBSL exceedances for benzene at QMW3, QMW4, and QMW16. RBSLs for naphthalene and total PAHs were also exceeded at QMW3 and QMW16. This investigation provided data that completed the delineation of the shallow groundwater plumes (Foster Wheeler Environmental, 2000). Plume concentration maps are included in Appendix C.

**2.5 Corrective Action Plan**

A CAP and a sampling and analysis plan were requested by SCDHEC following the results of the assessment investigations. E&E submitted the requested CAP in September 2000, which SCDHEC subsequently approved (E&E, 2000; SCDHEC, 2002). As part of the CAP, nine groundwater monitoring wells were selected for long-term monitored natural attenuation (MNA). Eight shallow depth wells (QMW3, QMW4, QMW6 (background), QMW7, QMW14, QMW16, QMW20, and QMW23)

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and one intermediate depth well (QMW12-I) are to be sampled annually for BTEX, PAHs, and natural attenuation parameters.

**2.6 Long Term Monitoring**

In June 2004, CH2M Hill conducted an LTM event in accordance with the SCDHEC approved CAP (E&E, 2000; SCDHEC, 2002). Groundwater samples were collected from nine monitoring wells. The samples were analyzed for BTEX, PAHs, metals, and natural attenuation parameters. Monitoring wells QMW3, QMW4, QMW14, and QMW16 exceeded the RBSL for benzene and QMW3, QMW7, QMW14, and QMW16 exceeded the RBSL for PAHs. Copies of the plume maps for this event are included in Appendix D (CH2M Hill, 2005).

**2.7 CAP Addendum**

Based on the results of the June 2004 CH2M Hill LTM event, ARCADIS recommended modifications to the CAP (ARCADIS, 2005). The CAP addendum was approved by SCDHEC on July 14, 2005 (SCDHEC, 2005). The addendum included the deletion of select natural attenuation parameters, removal of monitoring wells QMW7, QMW20 from the monitoring program, and the addition of monitoring wells QMW8, QMW10, QMW17, QMW19, QMW21, and QMW22 to the monitoring program.

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### 3.0 Long Term Monitoring Activities

In accordance with the CAP (E&E, 2000) and the CAP Addendum (ARCADIS, 2005), a LTM event was conducted in August 2005. LTM activities included collection of groundwater level measurements and groundwater samples from select monitoring wells for laboratory analysis.

#### 3.1 Groundwater Level Monitoring

Prior to initiating the groundwater sampling event, site-wide groundwater level measurements were recorded from 24 existing monitoring wells. Table 3-1 presents a comparison of the August 2005 groundwater levels with historical water levels recorded during previous investigations.

#### 3.2 Groundwater Sampling and Analysis

Beginning on August 30, 2005, ARCADIS collected groundwater samples from 14 existing monitoring wells QMW3, QMW4, QMW6, QMW8, QMW10, QMW12-I, QMW14, QMW16, QMW17, QMW19 through QMW22, and QMW23.

Groundwater sampling was performed using low-flow, or micropurge, procedures in accordance with Section 7 of the US Environmental Protection Agency (USEPA) Region 4 *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual* (USEPA, 2001) and the Field Sampling Plan (ARCADIS, 2004). Following sample collection, with the exception of the dissolved gases, the samples were transported in properly cooled and sealed containers to Shealy Environmental Services, Inc. (South Carolina Certified Laboratory #32010) in Cayce, South Carolina. The dissolved gases were shipped priority overnight in properly cooled and sealed containers to Microseeps, Inc. in Pittsburgh, Pennsylvania. All samples collected were analyzed for the following constituents:

- BTEX, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene by EPA method 8260B;
- Semi-volatile organic compounds (SVOCs) and polynuclear aromatic hydrocarbons (PAHs) by EPA method 8270C;
- Methane by method AM20GAX;

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- Nitrate and sulfate by EPA method 9056;
- Nitrite by EPA method 353.2;
- Sulfide by EPA method 376.1; and
- Ferrous iron by EPA method SM3500.

Laboratory analytical reports including chain of custody forms are provided in Appendix E. A summary of the analytical data along with historical data from previous investigations is included in Table 3-2. Field parameters including pH, temperature, dissolved oxygen (DO), conductivity, and oxidation reduction potential (ORP), were recorded for each monitoring well sampled during this event and are presented in Table 3-3.

### 3.3 Investigation Derived Waste

The waste generated from activities related to groundwater monitoring consisted of decontaminated fluids, purge water, personal protective equipment (PPE), and general refuse (i.e. paper, plastic, etc.). Decontamination fluids and purge water were segregated in 55-gallon drums. The drums will be characterized and disposed of in accordance with the *Final Ft. Jackson Investigation Derived Waste (IDW) Management Plan* (USACE, 1998). All spent PPE was screened with an organic vapor monitor, decontaminated if necessary, and placed with the general refuse in dumpsters at Fort Jackson.



**Table 3-1**  
**Summary of Historical Groundwater Elevations at UST Site #1**  
 Fort Jackson, South Carolina

Well ID	Well Diameter (inches)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (ft msl <sup>1</sup> )	Date	Depth to Water (ft bloc)	Water Level Elevation (ft msl)	Change in Elevation (feet)
QMW1	2	14	4 - 14	200.41	08/16/95	4.81	195.60	NA
					02/04/97	3.93	196.48	0.88
					03/11/99	4.54	195.87	-0.61
					09/07/99	5.63	194.78	-1.09
					06/22/04	NM	NA	NA
					08/29/05	4.32	196.09	1.31
QMW2	2	14	4 - 14	201.61	08/16/95	6.88	194.73	NA
					02/04/97	6.82	194.79	0.06
					03/11/99	7.01	194.60	-0.19
					09/07/99	7.74	193.87	-0.73
					06/22/04	NM	NA	NA
					08/29/05	6.70	194.91	1.04
QMW3	2	15	5 - 15	200.80	08/16/95	7.35	193.45	NA
					02/04/97	6.96	193.84	0.39
					03/11/99	7.25	193.55	-0.29
					09/07/99	8.33	192.47	-1.08
					06/22/04	7.08	193.72	1.25
					08/29/05	7.02	193.78	0.06
QMW4	2	14	4 - 14	198.74	08/16/95	6.40	192.34	NA
					02/04/97	5.70	193.04	0.70
					03/11/99	5.99	192.75	-0.29
					09/07/99	7.14	191.60	-1.15
					06/22/04	5.09	193.65	2.05
					08/29/05	6.00	192.74	-0.91
QMW5	2	14	4 - 14	199.02	08/16/95	4.92	194.10	NA
					02/04/97	4.66	194.36	0.26
					03/11/99	5.03	193.99	-0.37
					09/07/99	6.13	192.89	-1.10
					06/22/04	4.26	194.76	1.87
					08/29/05	4.86	194.16	-0.60
QMW6	2	15	5 - 15	202.83	08/16/95	7.56	195.27	NA
					02/04/97	6.71	196.12	0.85
					03/11/99	7.80	195.03	-1.09
					09/07/99	8.24	194.59	-0.44
					06/22/04	7.21	195.62	1.03
					08/29/05	7.46	195.37	-0.25
QMW7	2	14	4 - 14	201.05	08/16/95	5.50	195.55	NA
					02/04/97	4.91	196.14	0.59
					03/11/99	5.46	195.59	-0.55
					09/07/99	6.17	194.88	-0.71
					06/22/04	4.57	196.48	1.60
					08/29/05	4.75	196.30	-0.18
QMW8	2	13	3 - 13	194.12	08/16/95	5.86	188.26	NA
					02/04/97	5.38	188.74	0.48
					03/11/99	5.46	188.66	-0.08
					09/07/99	6.49	187.63	-1.03
					06/22/04	5.24	188.88	1.25
					08/29/05	5.46	188.66	-0.22
QMW9	2	14	4 - 14	195.98	08/16/95	4.87	191.11	NA
					02/04/97	4.20	191.78	0.67
					03/11/99	4.69	191.29	-0.49
					09/07/99	6.02	189.96	-1.33
					06/22/04	3.90	192.08	2.12
					08/29/05	4.35	191.63	-0.45
QMW10	2	13	3 - 13	194.13	08/16/95	3.97	190.16	NA
					02/04/97	3.59	190.54	0.38
					03/11/99	3.72	190.41	-0.13
					09/07/99	6.62	187.51	-2.90
					06/22/04	3.03	191.10	3.59
					08/29/05	3.52	190.61	-0.49

**Table 3-1**  
**Summary of Historical Groundwater Elevations at UST Site #1**  
 Fort Jackson, South Carolina

Well ID	Well Diameter (inches)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (ft msl <sup>1</sup> )	Date	Depth to Water (ft btoc)	Water Level Elevation (ft msl)	Change in Elevation (feet)
QMW11-I	2	34	24 - 34	200.02	08/16/95	5.70	194.32	NA
					02/04/97	5.21	194.81	0.49
					03/11/99	5.34	194.68	-0.13
					09/07/99	6.10	193.92	-0.76
					06/22/04	4.71	195.31	1.39
					08/29/05	4.76	195.26	-0.05
QMW12-I	2	34	24 - 34	199.96	08/16/95	6.70	193.26	NA
					02/04/97	3.38	196.58	3.32
					03/11/99	6.66	193.30	-3.28
					09/07/99	7.83	192.13	-1.17
					06/22/04	3.52	196.44	4.31
					08/29/05	6.87	193.09	-3.35
QMW13-I	2	34	24 - 34	194.24	08/16/95	6.12	188.12	NA
					02/04/97	5.32	188.92	0.80
					03/11/99	5.98	188.26	-0.66
					09/07/99	6.97	187.27	-0.99
					06/22/04	5.87	188.37	1.10
					08/29/05	5.34	188.90	0.53
QMW14	2	15	5 - 15	NS	08/16/95	4.24	NA	NA
					02/04/97	3.54	NA	NA
					03/11/99	3.96	NA	NA
					09/07/99	5.50	NA	NA
					06/22/04	2.85	NA	NA
					08/29/05	3.62	NA	NA
QMW15	2	15	5 - 15	NS	08/16/95	5.36	NA	NA
					02/04/97	4.58	NA	NA
					03/11/99	5.15	NA	NA
					09/07/99	6.17	NA	NA
					06/22/04	3.94	NA	NA
					08/29/05	4.63	NA	NA
QMW16	2	15	5 - 15	NS	08/16/95	4.40	NA	NA
					02/04/97	3.58	NA	NA
					03/11/99	4.08	NA	NA
					09/07/99	5.38	NA	NA
					06/22/04	2.90	NA	NA
					08/29/05	3.68	NA	NA
QMW17	2	16	6 - 16	201.49	08/16/95	6.84	194.65	NA
					02/04/97	6.81	194.68	0.03
					03/11/99	6.98	194.51	-0.17
					09/07/99	7.34	194.15	-0.36
					06/22/04	6.54	194.95	0.80
					08/29/05	6.65	194.84	-0.11
QMW18	2	14	4 - 14	199.03	02/04/97	5.15	193.88	NA
					03/11/99	5.46	193.57	-0.31
					09/07/99	6.54	192.49	-1.08
					06/22/04	3.60	195.43	2.94
					08/29/05	5.25	193.78	-1.65
QMW19	2	12	2 - 12	195.00	02/04/97	3.29	191.71	NA
					03/11/99	3.77	191.23	-0.48
					09/07/99	5.10	189.90	-1.33
					06/22/04	2.71	192.29	2.39
					08/29/05	3.66	191.34	-0.95
QMW20	2	14	4 - 14	197.08	02/04/97	5.55	191.53	NA
					03/11/99	5.88	191.20	-0.33
					09/07/99	7.17	189.91	-1.29
					06/22/04	5.42	191.66	1.75
					08/29/05	6.55	190.53	-1.13
QMW21	2	14	4 - 14	198.68	02/04/97	6.15	192.53	NA
					03/11/99	6.62	192.06	-0.47
					09/07/99	7.82	190.86	-1.20
					06/22/04	6.49	192.19	1.33
					08/29/05	6.55	192.13	-0.06

**Table 3-1**  
**Summary of Historical Groundwater Elevations at UST Site #1**  
 Fort Jackson, South Carolina

Well ID	Well Diameter (inches)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (ft msl <sup>1</sup> )	Date	Depth to Water (ft btoc)	Water Level Elevation (ft msl)	Change in Elevation (feet)
QMWW22	2	12	2 - 12	193.25	02/04/97	3.65	189.60	NA
					03/11/99	9.02	184.23	-5.37
					09/07/99	9.95	183.30	-0.93
					06/22/04	8.89	184.36	1.06
					08/29/05	8.82	184.43	0.07
QMWW22A	2	18	8 - 18	201.91	03/11/99	3.91	198.00	NA
					09/07/99	7.20	194.71	-3.29
					06/22/04	2.85	199.06	4.35
					08/29/05	3.58	198.33	-0.73
QMWW23	2	16	6 - 16	197.21	09/07/99	5.93	191.28	NA
					09/07/99	4.97	192.24	0.96
					06/22/04	5.05	192.16	-0.08
					08/29/05	5.78	191.43	-0.73

ft bgs = feet below ground surface

ft btoc = feet below top of casing

ft msl = feet above mean sea level

NA = Not Available

NM = Not Measured

NS = Not Surveyed

<sup>1</sup>Elevations based upon MSL Datum (NGVD29) State Plane coordinates (NAD 83)



Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QMw1			QMw2			QMw3				
		Sample Date		6/1/1995	2/1/1997	9/7/1999	6/1/1995	2/1/1997	9/7/1999	6/1/1995	2/1/1997	9/7/1999	6/23/2004	8/31/2005
		RBSL	SSTL											
Ethane	µg/L												< 10 U	
Ethylene	µg/L												< 10 U	
Methane	µg/L												27800	430
Alkalinity as CaCO <sub>3</sub>	mg/L												126	
Chloride	mg/L												1.2	
Ferrous Iron <sup>2</sup>	mg/L												3	75
Nitrate-N	mg/L												< 0.034 U	0.02
Nitrite-N	mg/L												< 0.054 U	0.022
Ortho-phosphate	mg/L												0.027 J	
Sulfate	mg/L												4.8	0.44 BJ
Sulfide	mg/L												< 0.025 U	3.5
TOC Average	mg/L												18.6	
1,2,4-Trimethylbenzene	µg/L												2.8 J	0.84 J
1,3,5-Trimethylbenzene	µg/L												< 5 U	< 1 U
Benzene	µg/L	5	21571	< U	< U	< 5 U	< U	< U	< 5 U	240	210	366	91	40
Toluene	µg/L	1000	301000	< U	< U	< 5 U	< U	< U	< 5 U	16	21	27.8	7.7	2.9
Ethylbenzene	µg/L	700	280000	< U	< U	< 5 U	< U	< U	< 5 U	260	420	742	336	91
m-&p-Xylenes	µg/L	10000	278000	< U	< U	< 5 U	< U	< U	< 5 U	95	100	1210	14.1 J	3.8
Methyl tertiary-butyl ether	µg/L	40				< 5 U			< 5 U			< 25 U	< 5 U	< 1 U
1,2-Benz-phenanthracene	µg/L			< U		< 10 U	< U		< 10 U	1.7		< 10 U	< 0.96 U	< 1 U
1-Methylnaphthalene	µg/L			9.1			< U			54			68.2	
2-Chloronaphthalene	µg/L					< 10 U			< 10 U			< 10 U		
2-Methylnaphthalene	µg/L			3.9 J	< U	< 10 U	< U	< U	< 10 U	71	120	104	94.4	
Acenaphthene	µg/L			< U	< U	< 10 U	< U	< U	< 10 U	14 J	< U	< 10 U	2.5	2.5
Acenaphthylene	µg/L			< U		< 10 U	< U		< 10 U	13		< 10 U	< 0.96 U	< 1 U
Anthracene	µg/L			< U		< 10 U	< U		< 10 U	1.1		< 10 U	< 0.96 U	< 1 U
Benzo(a)anthracene	µg/L	10		2		< 10 U	< U		< 10 U	3.5		< 10 U	< 0.96 U	< 1 U
Benzo(a)pyrene	µg/L			< U		< 10 U	< U		< 10 U	< U		< 10 U	< 0.96 U	< 1 U
Benzo(b)fluoranthene	µg/L	10		< U		< 10 U	< U		< 10 U	< U		< 10 U	< 0.96 U	< 1 U
Benzo(g,h,i)perylene	µg/L			< U		< 10 U	< U		< 10 U	< U		< 10 U	< 0.96 U	< 1 U
Benzo(k)fluoranthene	µg/L	10		< U		< 10 U	< U		< 10 U	< U		< 10 U	< 0.96 U	< 1 U
Dibenzo(a,h)anthracene	µg/L	10				< 10 U			< 10 U			< 10 U	< 0.96 U	< 1 U
Fluoranthene	µg/L			6		< 10 U	< U		< 10 U	17		< 10 U	< 0.96 U	< 1 U
Fluorene	µg/L			1.1	< U	< 10 U	< U	< U	< 10 U	7.8	3.1 J	4.77 J	4.3	3.7
Indeno(1,2,3-cd)pyrene	µg/L			< U		< 10 U	< U		< 10 U	< U		< 10 U	< 0.96 U	< 1 U
Naphthalene	µg/L	25	2000	< U	< U	< 10 U	< U	< U	< 10 U	60	130	205	161	170
Phenanthrene	µg/L			1.1	< U	< 10 U	< U	< U	< 10 U	7.7	3.5 J	4.63 J	2.6	3.2
Pyrene	µg/L			8.3		< 10 U	< U		< 10 U	34		< 10 U	< 0.96 U	< 1 U
Total Naphthalenes	µg/L	25		13	< U	< 10 U	< U	< U	< 10 U	185	250	309	323.6	170
Total PAH	µg/L	25		31.5 J	< U	< 10 U	< U	< U	< 10 U	284.8 J	256.6	318.4	333	179.4

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample

<sup>2</sup>For Jun 2005, test performed with Hach Kit 8145.

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

J = Estimated Concentration

U = Not detected at the level reported



Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QMW4					QMW5		QMW6				
		Sample Date		6/1/1995	2/1/1997	9/7/1999	6/22/2004	8/31/2005	6/1/1995	2/1/1997	6/1/1995	6/1/1995 <sup>1</sup>	2/1/1997	6/24/2004	8/30/2005
		RBSL	SSTL												
Ethane	µg/L						< 10	U						< 10	U
Ethylene	µg/L						< 10	U						< 10	U
Methane	µg/L						6600	2100						27.2	18
Alkalinity as CaCO <sub>3</sub>	mg/L						21.5							9.08	J
Chloride	mg/L						2.62							1.42	
Ferrous Iron <sup>2</sup>	mg/L						2.1	2.6						2.1	< 0.05 U
Nitrate-N	mg/L						< 0.034	U	0.005	J				1.43	1.1
Nitrite-N	mg/L						< 0.054	U	0.006	J				< 0.054	< 0.02 U
Ortho-phosphate	mg/L						0.069	J						< 0.006	U
Sulfate	mg/L						2.28	5.9	B					1.91	2.2 B
Sulfide	mg/L						0.509	< 1	U					< 0.025	< 1 U
TOC Average	mg/L						3.23							0.887	
1,2,4-Trimethylbenzene	µg/L						5.4	< 1	U					< 1	< 1 U
1,3,5-Trimethylbenzene	µg/L						0.83	< 1	U					< 1	< 1 U
Benzene	µg/L	5	21571	30	170	82.6 J	19.9	2.6	< U	< U	< U	< U	< U	< 1	< 1 U
Toluene	µg/L	1000	301000	1.4 J	8.2	5.59 J	< 1.7	U	0.65 J	< U	< U	< U	< U	< 1	0.22 J
Ethylbenzene	µg/L	700	280000	1.8	7	7.54 J	1.1	< 1	U	< U	< U	< U	< U	< 1	< 1 U
m-&p-Xylenes	µg/L	10000	278000	34	150	66.4 J	14.5	0.64 J	< U	< U	< U	< U	< U	< 3	< 1 U
Methyl tertiary-butyl ether	µg/L	40				< 5	U	0.38 J	< 1	U				< 1	< 1 U
1,2-Benz-phenanthracene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
1-Methylnaphthalene	µg/L			< U			< 0.96	U		39	< U	< U		< 0.95	U
2-Chloronaphthalene	µg/L					< 10	U								
2-Methylnaphthalene	µg/L			< U	7 J	< 10	U	< 0.96	U	30	< U	< U	< U	< 0.95	U
Acenaphthene	µg/L			< U	< U	< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Acenaphthylene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Anthracene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Benzo(a)anthracene	µg/L	10		< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Benzo(a)pyrene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Benzo(b)fluoranthene	µg/L	10		< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Benzo(g,h,i)perylene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Benzo(k)fluoranthene	µg/L	10		< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Dibenzo(a,h)anthracene	µg/L	10		< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Fluoranthene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Fluorene	µg/L			< U	< U	< 10	U	< 0.96	U	< 1	U	1.7	< U	< 0.95	< 1 U
Indeno(1,2,3-cd)pyrene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Naphthalene	µg/L	25	2000	< U	14	< 10	U	0.87 J	0.19 J	20	< U	< U	< U	< 0.95	< 1 U
Phenanthrene	µg/L			< U	< U	< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Pyrene	µg/L			< U		< 10	U	< 0.96	U	< 1	U	< U	< U	< 0.95	< 1 U
Total Naphthalenes	µg/L	25		< U	21	< 10	U	0.87 J	0.19 J		< U	< U	< U	< 0.95	< 1 U
Total PAH	µg/L	25		< U	< U	< 10	U	0.87 J	0.19 J	90.7	< U	< U	< U	< 0.95	< 1 U

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample<sup>2</sup>For Jun 2005, test performed with Hach Kit 8146.

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

J = Estimated Concentration

U = Not detected at the level reported

Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QM7					QM8				QM9		
		Sample Date		6/1/1995	2/1/1997	2/1/1997 <sup>1</sup>	6/24/2004	6/24/2004 <sup>1</sup>	6/1/1995	2/1/1997	9/7/1999	9/1/2005	6/1/1995	2/1/1997	9/7/1999
		RBSL	SSTL												
Ethane	µg/L						4.8 J	< 10 U						< U	< 5 U
Ethylene	µg/L						< 10 U	< 10 U						< U	< 5 U
Methane	µg/L						5470	6290				13000		< U	< 5 U
Alkalinity as CaCO <sub>3</sub>	mg/L						61.4	64.4						< U	< 5 U
Chloride	mg/L						1.72	1.76							< 5 U
Ferrous Iron <sup>2</sup>	mg/L						4.3					22			
Nitrate-N	mg/L						< 0.034 U	< 0.034 U				< 0.02 U		< U	
Nitrite-N	mg/L						< 0.054 U	< 0.054 U				0.06			< 10 U
Ortho-phosphate	mg/L						0.064	0.077							< 10 U
Sulfate	mg/L						< 0.193 U	< 0.193 U				< 1 U			
Sulfide	mg/L						< 0.025 U	< 0.025 U				< 1 U		< U	< 10 U
TOC Average	mg/L						1.9	2.01						< U	< 10 U
1,2,4-Trimethylbenzene	µg/L						< 1 U	< 1 U				< 1 U			< 10 U
1,3,5-Trimethylbenzene	µg/L						< 1 U	< 1 U				< 1 U			< 10 U
Benzene	µg/L	5	21571	< U	< U	< U	< 1 U	< 1 U	< U	< U	< 5 U	< 1 U	< U		< 10 U
Toluene	µg/L	1000	301000	< U	< U	< U	< 1 U	< 1 U	< U	< U	< 5 U	0.22 J	< U		< 10 U
Ethylbenzene	µg/L	700	280000	< U	< U	< U	0.24 J	0.28 J	< U	< U	< 5 U	< 1 U	< U		< 10 U
m-&p-Xylenes	µg/L	10000	278000	< U	< U	< U	< 3 U	< 3 U	< U	< U	< 5 U	< 1 U	< U		< 10 U
Methyl tertiary-butyl ether	µg/L	40					< 1 U	< 1 U			1.52 J	0.74 J			< 10 U
1,2-Benz-phenanthracene	µg/L			0.52 J			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		< 10 U
1-Methylnaphthalene	µg/L			8			16.6	15.8	< U				< U	< U	< 10 U
2-Chloronaphthalene	µg/L										< 10 U				< 10 U
2-Methylnaphthalene	µg/L			5.1	13	14	23	21.7	< U	< U	< 10 U		< U	< U	< 10 U
Acenaphthene	µg/L			< U	< U	< U	0.67 J	0.63 J	< U	< U	< 10 U	< 1 U	< U	< U	< 10 U
Acenaphthylene	µg/L			< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		< 10 U
Anthracene	µg/L			< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		< 10 U
Benzo(a)anthracene	µg/L	10		< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Benzo(a)pyrene	µg/L			< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Benzo(b)fluoranthene	µg/L	10		< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Benzo(g,h,i)perylene	µg/L			< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Benzo(k)fluoranthene	µg/L	10		< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Dibenzo(a,h)anthracene	µg/L	10					< 0.95 U	< 0.95 U			< 10 U	< 1 U			
Fluoranthene	µg/L			1.3 J			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Fluorene	µg/L			0.85 J	< U	< U	1.9	1.9	< U	< U	< 10 U	< 1 U	< U		
Indeno(1,2,3-cd)pyrene	µg/L			< U			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Naphthalene	µg/L	25	2000	< U	11	11	14	13.1	< U	< U	< 10 U	< 1 U	< U		
Phenanthrene	µg/L			0.7 J	< U	< U	1.3	1.3	< U	< U	< 10 U	< 1 U	< U		
Pyrene	µg/L			1.8 J			< 0.95 U	< 0.95 U	< U		< 10 U	< 1 U	< U		
Total Naphthalenes	µg/L	25		13.1	24	25	53.6	50.6	< U	< U	< 10 U	< 1 U	< U	< U	< 10 U
Total PAH	µg/L	25		18.27 J	24	25	56.8	54.43 J	< U	< U	< 10 U	< 1 U	< U	< U	< 10 U

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample<sup>2</sup>For Jun 2005, test performed with Hach Kit 8146.

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

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U = Not detected at the level reported

Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QM10			QM11-I		QM12-I				
		Sample Date		6/1/1995	2/1/1997	9/1/2005	6/1/1995	2/1/1997	6/1/1995	2/1/1997	9/7/1999	6/23/2004	8/31/2005
		RBSL	SSTL										
Ethane	µg/L											< 10	U
Ethylene	µg/L											< 10	U
Methane	µg/L					6300						365	740
Alkalinity as CaCO <sub>3</sub>	mg/L											43.9	
Chloride	mg/L											6.01	
Ferrous Iron <sup>2</sup>	mg/L					32						1.8	0.86
Nitrate-N	mg/L					< 0.02	U					< 0.0341	U 0.003 J
Nitrite-N	mg/L					0.051						< 0.0542	U < 0.02 U
Ortho-phosphate	mg/L											0.145	
Sulfate	mg/L					< 1	U					3.65	3.4 B
Sulfide	mg/L					1.8						0.0896	J < 1 U
TOC Average	mg/L											1.65	
1,2,4-Trimethylbenzene	µg/L					< 1	U					< 1	U < 1 U
1,3,5-Trimethylbenzene	µg/L					< 1	U					< 1	U < 1 U
Benzene	µg/L	5	21571	< U	< U	0.21	J	< U	< U	1.2	< U	< 5	U < 1 U < 1 U
Toluene	µg/L	1000	301000	< U	< U	< 1	U	< U	< U	< U	< U	< 5	U < 1 U 0.43 J
Ethylbenzene	µg/L	700	280000	< U	< U	< 1	U	< U	< U	< U	< U	< 5	U < 1 U < 1 U
m- & p-Xylenes	µg/L	10000	278000	< U	< U	< 1	U	< U	< U	< U	< U	< 5	U < 1 U < 1 U
Methyl tertiary-butyl ether	µg/L	40				0.35	J					< 5	U < 1 U < 1 U
1,2-Benz-phenanthracene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
1-Methylnaphthalene	µg/L			< U				< U		< U		< 0.96	U
2-Chloronaphthalene	µg/L											< 10	U
2-Methylnaphthalene	µg/L			< U	< U			< U	< U	< U	< U	< 10	U < 0.96 U
Acenaphthene	µg/L			< U	< U	< 1	U	< U	< U	< U	< U	< 10	U < 0.96 U < 1 U
Acenaphthylene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Anthracene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Benzo(a)anthracene	µg/L	10		< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Benzo(a)pyrene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Benzo(b)fluoranthene	µg/L	10		< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Benzo(g,h,i)perylene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Benzo(k)fluoranthene	µg/L	10		< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Dibenzo(a,h)anthracene	µg/L	10				< 1	U					< 10	U < 0.96 U < 1 U
Fluoranthene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Fluorene	µg/L			< U	< U	< 1	U	< U	< U	< U	< U	< 10	U < 0.96 U < 1 U
Indeno(1,2,3-cd)pyrene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Naphthalene	µg/L	25	2000	< U	< U	< 1	U	< U	< U	< U	< U	< 10	U < 0.96 U < 1 U
Phenanthrene	µg/L			< U	< U	< 1	U	< U	< U	< U	< U	< 10	U < 0.96 U < 1 U
Pyrene	µg/L			< U		< 1	U	< U		< U		< 10	U < 0.96 U < 1 U
Total Naphthalenes	µg/L	25		< U	< U	< 1	U	< U	< U	< U	< U	< 10	U < 0.96 U < 1 U
Total PAH	µg/L	25		< U	< U	< 1	U	< U	< U	< U	< U	< 10	U < 0.96 U < 1 U

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample<sup>2</sup>For Jun 2005, test performed with Hach Kit 8146.

BTEx = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

J = Estimated Concentration

U = Not detected at the level reported



Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QM13-1				QM14				QM15		
		Sample Date		6/1/1995	6/1/1995 <sup>1</sup>	2/1/1997	9/7/1999	6/1/1995	2/1/1997	6/24/2004	9/1/2005	6/1/1995	2/1/1997	9/7/1999
		RBSL	SSTL											
Ethane	µg/L									4.92 J				
Ethylene	µg/L									< 10 U				
Methane	µg/L									9100	13000			
Alkalinity as CaCO <sub>3</sub>	mg/L									46.8				
Chloride	mg/L									1.59				
Ferrous Iron <sup>2</sup>	mg/L										42			
Nitrate-N	mg/L									< 0.034 U	< 0.02 U			
Nitrite-N	mg/L									< 0.054 U	0.043			
Ortho-phosphate	mg/L									0.059 J				
Sulfate	mg/L									< 0.193 U	< 1 U			
Sulfide	mg/L									0.152	< 1 U			
TOC Average	mg/L									5.15				
1,2,4-Trimethylbenzene	µg/L									244	310			
1,3,5-Trimethylbenzene	µg/L									9.8	5.2			
Benzene	µg/L	5	21571	< U	< U	< U	< 5 U	22	17	19.3	37	2	1.5 J	< 5 U
Toluene	µg/L	1000	301000	< U	< U	< U	< 5 U	15	13	< 6.9 U	14	< U	< U	< 5 U
Ethylbenzene	µg/L	700	280000	< U	< U	< U	< 5 U	220	320	278	470	< U	< U	< 5 U
m-&p-Xylenes	µg/L	10000	278000	< U	< U	< U	< 5 U	650	340	220	390	< U	< U	< 5 U
Methyl tertiary-butyl ether	µg/L	40					< 5 U			< 5 U	0.79 J			< 5 U
1,2-Benz-phenanthracene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
1-Methylnaphthalene	µg/L			< U	< U			4.3 J		6.4		< U		
2-Chloronaphthalene	µg/L						< 10 U							< 10 U
2-Methylnaphthalene	µg/L			< U	< U	< U	< 10 U	12	4 J	11.5		< U	< U	< 10 U
Acenaphthene	µg/L			< U	< U	< U	< 10 U	12	< U	< 0.96 U	< 1 U	< U	< U	< 10 U
Acenaphthylene	µg/L			< U	< U		< 10 U	34		< 0.96 U	< 1 U	< U		< 10 U
Anthracene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Benzo(a)anthracene	µg/L	10		< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Benzo(a)pyrene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Benzo(b)fluoranthene	µg/L	10		< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Benzo(g,h,i)perylene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Benzo(k)fluoranthene	µg/L	10		< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Dibenzo(a,h)anthracene	µg/L	10					< 10 U			< 0.96 U	< 1 U			< 10 U
Fluoranthene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Fluorene	µg/L			< U	< U	< U	< 10 U	0.88 J	< U	< 0.96 U	< 1 U	< U	< U	< 10 U
Indeno(1,2,3-cd)pyrene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Naphthalene	µg/L	25	2000	< U	< U	< U	< 10 U	80	56	62.4	100	< U	2.5 J	< 10 U
Phenanthrene	µg/L			< U	< U	< U	< 10 U	< U	< U	< 0.96 U	< 1 U	< U	< U	< 10 U
Pyrene	µg/L			< U	< U		< 10 U	< U		< 0.96 U	< 1 U	< U		< 10 U
Total Naphthalenes	µg/L	25		< U	< U	< U	< 10 U	96.3	60	80.3	100	< U	2.5 J	< 10 U
Total PAH	µg/L	25		< U	< U	< U	< 10 U	143.18 J	60	80.3	100	< U	2.5 J	< 10 U

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<sup>1</sup>Duplicate Sample<sup>2</sup>For Jun 2005, test performed with Hach Kit 8146

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

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U = Not detected at the level reported

Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QMWW16					QMWW17			QMWW18	
		Sample Date		6/1/1995	2/1/1997	9/7/1999	6/24/2004	9/1/2005	6/1/1995	2/1/1997	8/30/2005	2/1/1997	9/7/1999
		RBSL	SSTL										
Ethane	µg/L						9.01 J						
Ethylene	µg/L						< 10 U						
Methane	µg/L						7440	9700			8500		
Alkalinity as CaCO <sub>3</sub>	mg/L						112						
Chloride	mg/L						1.43						
Ferrous Iron <sup>2</sup>	mg/L						3.9	14			41		
Nitrate-N	mg/L						< 0.034 U	< 0.02 U			< 0.02 U		
Nitrite-N	mg/L						< 0.054 U	0.042			0.04		
Ortho-phosphate	mg/L						0.041 J						
Sulfate	mg/L						1.17	0.16 BJ			0.33 BJ		
Sulfide	mg/L						0.136	< 1 U			2.2		
TOC Average	mg/L						5.93						
1,2,4-Trimethylbenzene	µg/L						42.8	27			< 1 U		
1,3,5-Trimethylbenzene	µg/L						2.9	1.4			< 1 U		
Benzene	µg/L	5	21571	21	13 J	24.1	13.6	17	0.8	< U	0.26 J	< U	< 5 U
Toluene	µg/L	1000	301000	24	10.1	4.13 J	< 5.6 U	4.2	< U	< U	0.23 J	< U	< 5 U
Ethylbenzene	µg/L	700	280000	290	130	196	274	230	< U	< U	< 1 U	< U	< 5 U
m-&p-Xylenes	µg/L	10000	278000	220	160	55.2	70.8	45	< U	< U	< 1 U	< U	< 5 U
Methyl tertiary-butyl ether	µg/L	40				< 5 U	< 2 U	0.55 J			< 1 U		< 5 U
1,2-Benz-phenanthracene	µg/L			< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
1-Methylnaphthalene	µg/L			41			12.2		< U				
2-Chloronaphthalene	µg/L					< 10 U							< 10 U
2-Methylnaphthalene	µg/L			88	230	14.4	17.9		< U	< U		< U	< 10 U
Acenaphthene	µg/L			45	< U	< 10 U	< 0.95 U	< 1 U	< U	< U	< 1 U	< U	< 10 U
Acenaphthylene	µg/L			44		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Anthracene	µg/L			< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Benzo(a)anthracene	µg/L	10		< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Benzo(a)pyrene	µg/L			< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Benzo(b)fluoranthene	µg/L	10		< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Benzo(g,h,i)perylene	µg/L			< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Benzo(k)fluoranthene	µg/L	10		< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Dibenzo(a,h)anthracene	µg/L	10				< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Fluoranthene	µg/L			4.1		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Fluorene	µg/L			7.3	46	< 10 U	< 0.95 U	< 1 U	< U	< U	< 1 U	< U	< 10 U
Indeno(1,2,3-cd)pyrene	µg/L			< U		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Naphthalene	µg/L	25	2000	170	200	86.3	110	74	< U	< U	< 1 U	< U	< 10 U
Phenanthrene	µg/L			2.8	5.1 J	< 10 U	< 0.95 U	< 1 U	< U	< U	< 1 U	< U	< 10 U
Pyrene	µg/L			6.2		< 10 U	< 0.95 U	< 1 U	< U		< 1 U		< 10 U
Total Naphthalenes	µg/L	25		299	430	100.7	140.1	74	< U	< U	< 1 U	< U	< 10 U
Total PAH	µg/L	25		408.4	481.1	100.7	140.1	74	< U	< U	< 1 U	< U	< 10 U

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample<sup>2</sup>For Jun 2005, test performed with Hach Kit 8146.

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

J = Estimated Concentration

U = Not detected at the level reported

**Table 3-2**  
**Summary of Historical Analytical Data for Groundwater at UST Site #1**  
**Fort Jackson, South Carolina**

Chemical Name	Unit	Well ID		QMW19			QMW20					QMW21		
		Sample Date		2/1/1997	9/7/1999	8/31/2005	2/1/1997	2/1/1997 <sup>1</sup>	9/7/1999	8/24/2004	8/30/2005	2/1/1997	9/7/1999	8/30/2005
		RBSL	SSTL											
Ethane	µg/L									< 10 U				
Ethylene	µg/L									< 10 U				
Methane	µg/L					29				21700	10000			630
Alkalinity as CaCO <sub>3</sub>	mg/L									109				
Chloride	mg/L									1.55				
Ferrous Iron <sup>2</sup>	mg/L					7.8				9.5	46			66
Nitrate-N	mg/L					0.064				< 0.034 U	0.02			< 0.02 U
Nitrite-N	mg/L					0.011 J				< 0.054 U	0.023			0.045
Ortho-phosphate	mg/L									0.075				
Sulfate	mg/L					21 B				< 0.193 U	0.3 BJ			7.5 B
Sulfide	mg/L					8.2				< 0.124 U	< 1 U			4.1
TOC Average	mg/L									5.03				
1,2,4-Trimethylbenzene	µg/L					< 1 U				1.4	0.31 J			< 1 U
1,3,5-Trimethylbenzene	µg/L					< 1 U				0.66 J	< 1 U			< 1 U
Benzene	µg/L	5	21571	1.4 J	4.19 J	< 1 U	< U	< U	< 5 U	< 1 U	0.27 J	< U	< 5 U	14
Toluene	µg/L	1000	301000	< U	< 5 U	0.38 J	1 J	< U	< 5 U	< 0.68 U	1.2	< U	< 5 U	0.96 J
Ethylbenzene	µg/L	700	280000	< U	< 5 U	< 1 U	< U	< U	< 5 U	0.41 J	0.35 J	< U	< 5 U	7.2
m-&p-Xylenes	µg/L	10000	278000	1.6 J	< 5 U	< 1 U	1.9 J	2 J	6.54	7	1.7	< U	< 5 U	1.2
Methyl tertiary-butyl ether	µg/L	40			< 5 U	< 1 U			< 5 U	< 1 U	< 1 U		< 5 U	< 1 U
1,2-Benz-phenanthracene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
1-Methylnaphthalene	µg/L									< 0.96 U				
2-Chloronaphthalene	µg/L				< 10 U				< 10 U				< 10 U	
2-Methylnaphthalene	µg/L			< U	< 10 U		< U	< U	< 10 U	< 0.96 U		< U	< 10 U	
Acenaphthene	µg/L			< U	< 10 U	< 1 U	< U	< U	< 10 U	< 0.96 U	< 1 U	< U	< 10 U	0.24 J
Acenaphthylene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Anthracene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Benzo(a)anthracene	µg/L	10			< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Benzo(a)pyrene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Benzo(b)fluoranthene	µg/L	10			< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Benzo(g,h,i)perylene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Benzo(k)fluoranthene	µg/L	10			< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Dibenzo(a,h)anthracene	µg/L	10			< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Fluoranthene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Fluorene	µg/L			< U	< 10 U	< 1 U	< U	< U	< 10 U	< 0.96 U	< 1 U	< U	< 10 U	< 1 U
Indeno(1,2,3-cd)pyrene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Naphthalene	µg/L	25	2000	6.3 J	< 10 U	0.11 J	< U	< U	< 10 U	2.4	< 1 U	< U	< 10 U	3.8
Phenanthrene	µg/L			< U	< 10 U	< 1 U	< U	< U	< 10 U	< 0.96 U	< 1 U	< U	< 10 U	< 1 U
Pyrene	µg/L				< 10 U	< 1 U			< 10 U	< 0.96 U	< 1 U		< 10 U	< 1 U
Total Naphthalenes	µg/L	25		6.3 J	< 10 U	0.11 J	< U	< U	< 10 U	2.4	< 1 U	< U	< 10 U	3.8
Total PAH	µg/L	25		6.3 J	< 10 U	0.11 J	< U	< U	< 10 U	2.4	< 1 U	< U	< 10 U	4.04

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample<sup>2</sup>For Jun 2005, test performed with Hach Kit 8145.

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

J = Estimated Concentration

U = Not detected at the level reported

Table 3-2  
Summary of Historical Analytical Data for Groundwater at UST Site #1  
Fort Jackson, South Carolina

Chemical Name	Unit	Well ID		QM22			QM22A	QM23			
		Sample Date		2/1/1997	9/7/1999	8/31/2005	9/7/1999	9/7/1999	9/7/1999 <sup>1</sup>	6/22/2004	8/31/2005
		RBSL	SSTL								
Ethane	µg/L									< 10 U	
Ethylene	µg/L									< 10 U	
Methane	µg/L					230				3590	2600
Alkalinity as CaCO <sub>3</sub>	mg/L									50.7	
Chloride	mg/L									1.75	
Ferrous Iron <sup>2</sup>	mg/L					24				2.9	28
Nitrate-N	mg/L					0.011 J				< 0.034 U	0.024
Nitrite-N	mg/L					0.022				< 0.054 U	0.029
Ortho-phosphate	mg/L									0.071 J	
Sulfate	mg/L					6 B				1.13	1.3 B
Sulfide	mg/L					< 1 U				0.05 J	< 1 U
TOC Average	mg/L									3.79	
1,2,4-Trimethylbenzene	µg/L					< 1 U				< 1 U	< 1 U
1,3,5-Trimethylbenzene	µg/L					< 1 U				< 1 U	< 1 U
Benzene	µg/L	5	21571	< U	< 5 U	< 1 U	< 5 U	1.25 J	1.24 J	< 1 U	< 1 U
Toluene	µg/L	1000	301000	< U	< 5 U	0.24 J	< 5 U	< 5 U	< 5 U	< 1 U	0.3 J
Ethylbenzene	µg/L	700	280000	< U	< 5 U	< 1 U	< 5 U	< 5 U	< 5 U	< 1 U	< 1 U
m-&p-Xylenes	µg/L	10000	278000	< U	< 5 U	< 1 U	< 5 U	< 5 U	< 5 U	< 3 U	0.28 J
Methyl tertiary-butyl ether	µg/L	40			< 5 U	< 1 U	4.2 J	< 5 U	< 5 U	< 1 U	< 1 U
1,2-Benz-phenanthracene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
1-Methylnaphthalene	µg/L									< 0.97 U	
2-Chloronaphthalene	µg/L				< 10 U		< 10 U	< 10 U	< 10 U		
2-Methylnaphthalene	µg/L			< U	< 10 U		< 10 U	< 10 U	< 10 U	< 0.97 U	
Acenaphthene	µg/L			< U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Acenaphthylene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Anthracene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Benzo(a)anthracene	µg/L	10			< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Benzo(a)pyrene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Benzo(b)fluoranthene	µg/L	10			< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Benzo(g,h,i)perylene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Benzo(k)fluoranthene	µg/L	10			< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Dibenzo(a,h)anthracene	µg/L	10			< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Fluoranthene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Fluorene	µg/L			< U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Indeno(1,2,3-cd)pyrene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Naphthalene	µg/L	25	2000	< U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	0.14 J
Phenanthrene	µg/L			< U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Pyrene	µg/L				< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	< 1 U
Total Naphthalenes	µg/L	25		< U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	0.14 J
Total PAH	µg/L	25		< U	< 10 U	< 1 U	< 10 U	< 10 U	< 10 U	< 0.97 U	0.14 J

Shading = Concentration exceeds RBSL

Blank = Constituent not analyzed or reported

<sup>1</sup>Duplicate Sample

<sup>2</sup>For Jun 2005, test performed with Hach Kit 8146.

BTEX = Benzene, Toluene, Ethylbenzene, Xylene

PAH = Polynuclear Aromatic Hydrocarbons

RBSL = Risk-Based Screening Level

J = Estimated Concentration

U = Not detected at the level reported



**Table 3-3**  
**Summary of Field Parameters at UST Site #1**  
 Fort Jackson, South Carolina

Monitoring Well Identification	Collection Date (mm/dd/yy)	Collection Time (hr.min)	Initial Depth to Water (ft btoc)	Total Volume Removed (gallons)	Final							Comments
					pH (SU)	Cond. (mS/cm)	Temp. (°C)	Turb. (NTU)	ORP (mV)	DO (mg/L)	TDS (g/L)	
QMW3	8/31/2005	10:40	7.12	0.75	6.39	0.44	27.03	NM	-86.7	2.56	NM	
QMW4	8/31/2005	15:05	6.05	0.75	5.11	0.05	24.82	NM	80.3	0.95	NM	
QMW6	8/30/2005	10:03	7.47	0.75	4.83	0.05	24.03	NM	86.7	1.59	NM	
QMW8	9/1/2005	14:07	5.60	0.75	6.37	0.50	25.34	NM	-39.6	1.52	NM	
QMW10	9/1/2005	11:27	3.68	0.75	5.9	0.32	30.55	NM	-5.5	1.84	NM	
QMW12-I	8/31/2005	15:59	6.78	0.75	5.56	0.12	22.86	NM	92.3	1.08	NM	
QMW14	9/1/2005	12:14	3.86	1.25	6.26	0.26	26.86	NM	-51.4	1.50	NM	
QMW16	9/1/2005	13:12	3.91	0.75	6.6	0.39	26.95	NM	-76.1	1.09	NM	
QMW17	8/30/2005	12:29	6.65	0.75	5.81	0.33	27.76	NM	-18.9	1.69	NM	
QMW19	8/31/2005	13:20	3.70	0.75	6.79	0.72	25.67	NM	-95	1.45	NM	
QMW20	8/30/2005	15:28	5.57	1.00	6.24	0.26	28.93	NM	-99.9	0.58	NM	
QMW21	8/30/2005	14:30	6.55	0.75	6.09	0.27	26.91	NM	-45.2	1.64	NM	
QMW22	8/31/2005	9:14	8.86	0.75	5.74	0.16	23.80	NM	36.6	1.86	NM	
QMW23	8/31/2005	12:22	5.86	0.75	6.05	0.14	24.84	NM	-35	1.51	NM	





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## **4.0 Data Evaluation**

The data collected during the August 2005 LTM event was analyzed and compared with historical analysis to determine the effectiveness of natural attenuation in reducing groundwater concentrations. A summary of the analysis is provided below.

### **4.1 Data Validation**

The analytical data for groundwater samples collected at the Site were validated in accordance with the National Functional Guidelines. The complete results of the data quality evaluation are provided in Appendix F. The purpose of the data quality evaluation was to determine the reliability of the chemical analyses, the accuracy, and the precision of information acquired from the laboratory. Data quality was assessed through the review and evaluation of field sampling activities, quality control samples, and data associated with the chemical analytical results. The analytical data associated with the Site are considered quantitative and usable.

### **4.2 Groundwater Elevations**

Groundwater elevation measurements recorded prior to the August 2005 monitoring event are presented in Table 3-1. A comparison of historical groundwater elevations with current groundwater elevations indicate water levels in a majority of the monitoring wells have slightly decreased in the shallow and intermediate water units between June 2004 and August 2005 (Table 3-1).

A potentiometric map of the shallow water table unit is included as Figure 4-1. One surface water body influences groundwater flow at UST Site #1. Wildcat Creek, located to the east and to the south of the site, influences groundwater flow beneath the site. Based on the groundwater elevation measurements collected on August 29, 2005, groundwater in the shallow water table unit and the intermediate piezometric unit generally flows radially to the east toward Wildcat Creek and south-southwest toward Wildcat Creek. This groundwater flow pattern is consistent with historical flow directions. In addition, water levels from AOC B/SWMU 14 located on the opposite side of Wildcat Creek show that groundwater flows toward Wildcat Creek from both sides and that Wildcat Creek is a discharge boundary for UST Site #1.

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**FTJA 34 UST Site #1  
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Table 3-2 presents a summary of the historical and August 2005 analytical results for volatile organic compounds (VOCs) and biogeochemical parameters. Analytical data shows that all of the results were well below the SSTLs. Three small areas of groundwater, one around QMW3, one around QMW14 and QMW16, and one around QMW21 have benzene concentrations above the RBSL of 5 µg/L. It is important to note that benzene concentrations in QMW4 have decreased to below the RBSL from June 2004 (19.9 µg/L) to August 2005 (2.6 µg/L).

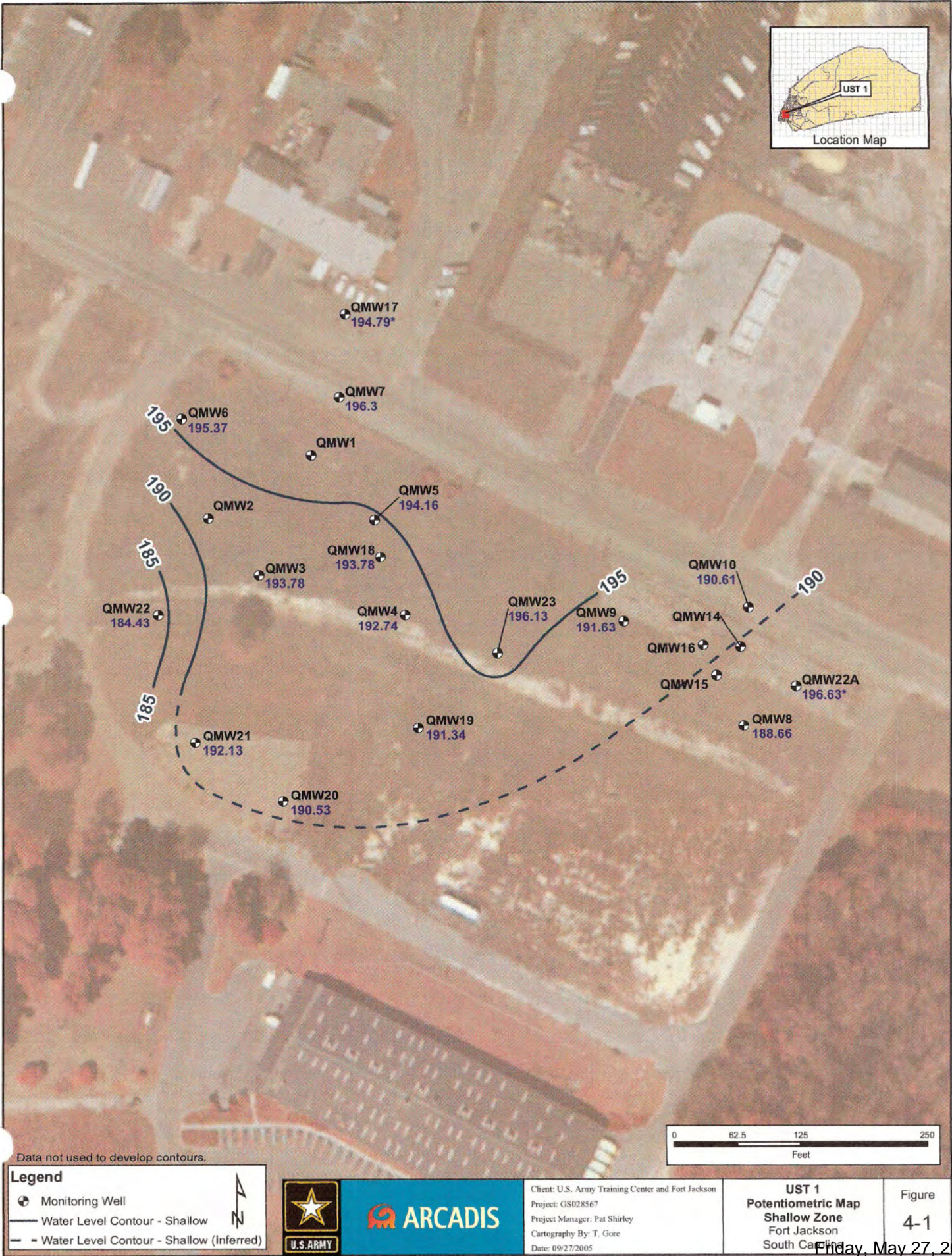
The highest benzene concentration is in QMW3 (40 µg/L) at Area B. Naphthalene concentrations also exceeded the RBSL of 25 µg/L in monitoring well QMW3 (170 µg/L). Although this well has the highest concentration of benzene and naphthalene, the historical concentrations for benzene (as high as 366 µg/L in September 1999) and naphthalene (as high as 205 µg/L in September 1999) show a long term decreasing trend. In addition to the decreasing trends, the increase in concentration of ferrous iron from 3 mg/L in June 2004 to 75 mg/L in August 2005 (produced from the reduction of ferric iron and indicative of iron reducing processes) and the increase in sulfide from below detection in June 2004 to 3.5 mg/L in August 2005 (produced from the reduction of sulfate and indicative of sulfate reducing conditions) indicates that the active in-situ degradation is occurring through anaerobic processes at QMW-3.

The concentrations of benzene and naphthalene have fluctuated at QMW16, however, overall the concentrations are decreasing. The increase in methane (indicative of methanogenic conditions) at both wells and increase in ferrous iron at QMW-16 indicates that active anaerobic activity is occurring in this area.

Monitoring well QMW21 which has not been sampled since June 1999, showed a slight exceedance of the RBSL for benzene. Additional long term monitoring is needed to verify and evaluate the concentrations detected in the August 2005 sampling event.

All three intermediate depth groundwater monitoring wells (QMW11-I, QMW12-I, and QMW13-I) were below RBSLs for all parameters analyzed, indicating there has is no contaminant vertical migration into the underlying water unit. Figures 4-2 and 4-3 present the benzene and naphthalene concentrations in the shallow water table unit.















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UST Site #1 is separated into two facilities. While in operation, fifteen USTs and one above ground storage tanks were located at the Site and were used to store fuel, gasoline, and solvents. All of the storage tanks have since been removed and the area is currently a relatively flat grassy lot. Several investigations of the Site were conducted which identified soil and groundwater contaminated with Benzene and PAHs.

The analytical results of the August 2005 sampling event indicate the groundwater concentrations are continuing to decrease in most of the site monitoring wells. In the area of QMW3, benzene and benzene and naphthalene concentrations indicate long term decreasing trends. Slight exceedances of the benzene RBSL were reported in QMW21. Two monitoring wells in the area of QMW14 remain above RBSLs for benzene and naphthalene with slight decreasing trend in one well while concentrations remain constant in the other well. However, all of the concentrations detected in the August 2005 sampling event were below SSTLs. The biogeochemical data also indicate that anaerobic biodegradation is reducing contaminant concentrations at the site.

Based on an evaluation of the historical and August 2005 data, continuation of LTM is recommended for the Site.

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Monitoring Report**U.S. Army Training Center  
and Fort Jackson**6.0 References**

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# APPENDIX

## FF



### 3.0 DESCRIPTION OF INDIVIDUAL SITES

#### 3.1 BUILDING 1062

Site 1 (Building 1062) was the main base gas station which is now abandoned. It was constructed in the 1980s and used as a gas station only. The building has been removed and the area is concrete and grass. The site is located away from other buildings and is now an open space. The three 10,000-gallon storage tanks located at the site have been removed and plastic sheeting was placed at the base of the excavation and covered with the excavated soils. Analysis of soil and water samples collected following tank excavation indicate benzene, toluene, ethylbenzene, and xylenes (BTEX) concentrations ranging from 360 to 3500 ppb for water and 1 to 570 ppb for soil.

#### 3.2 BUILDING 1565

Building <sup>65</sup>1556, Site 2, was a small shed that was constructed in the 1940s and used to store refueling records. The building has been removed from the site. The site is overlain with asphalt and the surrounding area is used for large storage buildings. The two USTs (one gasoline and one diesel) have been removed and plastic sheeting was placed at the base of the excavation and covered with the excavated soils. Analysis of soil samples collected following tank excavation indicate concentrations of BTEX ranging from 1 to 45 ppb and of Total Petroleum Hydrocarbons (TPH) ranging from 75 to 158 ppm.

#### 3.3 BUILDING 1741

Building 1741, Site 3, was constructed in the 1940s as a barracks and continues in this use today. The surrounding area is barracks and open fields. Site 3 contained a 500-gallon heating oil tank. The tank has been removed and plastic sheeting was placed at the base of the excavation and covered with the excavated soils. Analysis of soil samples collected following tank excavation indicate concentrations of TPH ranging from 196 to 270 ppm for soil.

The existing data from the Fort Jackson site was extremely limited. Aerial/spatial distribution had not been determined at any of the sites. Data was only available for samples collected directly from the tank excavation and soil and water analyses indicated the presence of contamination at each site. The analytical results are consistent with the type of product of (i.e., gasoline, diesel, fuel oil) present at each site.

**Table 3-1**  
**Summary of Historical Groundwater Elevations at UST Site #1**  
 Fort Jackson, South Carolina

Well ID	Well Diameter (inches)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (ft msl <sup>1</sup> )	Date	Depth to Water (ft btoc)	Water Level Elevation (ft msl)	Change in Elevation (feet)
QMW1	2	14	4 - 14	200.41	08/16/95	4.81	195.60	NA
					02/04/97	3.93	196.48	0.88
					03/11/99	4.54	195.87	-0.61
					09/07/99	5.63	194.78	-1.09
					06/22/04	NM	NA	NA
					08/29/05	4.32	196.09	1.31
QMW2	2	14	4 - 14	201.61	08/16/95	6.88	194.73	NA
					02/04/97	6.82	194.79	0.06
					03/11/99	7.01	194.60	-0.19
					09/07/99	7.74	193.87	-0.73
					06/22/04	NM	NA	NA
					08/29/05	6.70	194.91	1.04
QMW3	2	15	5 - 15	200.80	08/16/95	7.35	193.45	NA
					02/04/97	6.96	193.84	0.39
					03/11/99	7.25	193.55	-0.29
					09/07/99	8.33	192.47	-1.08
					06/22/04	7.08	193.72	1.25
					08/29/05	7.02	193.78	0.06
QMW4	2	14	4 - 14	198.74	08/16/95	6.40	192.34	NA
					02/04/97	5.70	193.04	0.70
					03/11/99	5.99	192.75	-0.29
					09/07/99	7.14	191.60	-1.15
					06/22/04	5.09	193.65	2.05
					08/29/05	6.00	192.74	-0.91
QMW5	2	14	4 - 14	199.02	08/16/95	4.92	194.10	NA
					02/04/97	4.66	194.36	0.26
					03/11/99	5.03	193.99	-0.37
					09/07/99	6.13	192.89	-1.10
					06/22/04	4.26	194.76	1.87
					08/29/05	4.86	194.16	-0.60
QMW6	2	15	5 - 15	202.83	08/16/95	7.56	195.27	NA
					02/04/97	6.71	196.12	0.85
					03/11/99	7.80	195.03	-1.09
					09/07/99	8.24	194.59	-0.44
					06/22/04	7.21	195.62	1.03
					08/29/05	7.46	195.37	-0.25
QMW7	2	14	4 - 14	201.05	08/16/95	5.50	195.55	NA
					02/04/97	4.91	196.14	0.59
					03/11/99	5.46	195.59	-0.55
					09/07/99	6.17	194.88	-0.71
					06/22/04	4.57	196.48	1.60
					08/29/05	4.75	196.30	-0.18
QMW8	2	13	3 - 13	194.12	08/16/95	5.86	188.26	NA
					02/04/97	5.38	188.74	0.48
					03/11/99	5.46	188.66	-0.08
					09/07/99	6.49	187.63	-1.03
					06/22/04	5.24	188.88	1.25
					08/29/05	5.46	188.66	-0.22
QMW9	2	14	4 - 14	195.98	08/16/95	4.87	191.11	NA
					02/04/97	4.20	191.78	0.67
					03/11/99	4.69	191.29	-0.49
					09/07/99	6.02	189.96	-1.33
					06/22/04	3.90	192.08	2.12
					08/29/05	4.35	191.63	-0.45
QMW10	2	13	3 - 13	194.13	08/16/95	3.97	190.16	NA
					02/04/97	3.59	190.54	0.38
					03/11/99	3.72	190.41	-0.13
					09/07/99	6.62	187.51	-2.90
					06/22/04	3.03	191.10	3.59
					08/29/05	3.52	190.61	-0.49

**Table 3-1**  
**Summary of Historical Groundwater Elevations at UST Site #1**  
 Fort Jackson, South Carolina

Well ID	Well Diameter (inches)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (ft msl <sup>1</sup> )	Date	Depth to Water (ft bloc)	Water Level Elevation (ft msl)	Change in Elevation (feet)
QMW11-I	2	34	24 - 34	200.02	08/16/95	5.70	194.32	NA
					02/04/97	5.21	194.81	0.49
					03/11/99	5.34	194.68	-0.13
					09/07/99	6.10	193.92	-0.76
					06/22/04	4.71	195.31	1.39
					08/29/05	4.76	195.26	-0.05
QMW12-I	2	34	24 - 34	199.96	08/16/95	6.70	193.26	NA
					02/04/97	3.38	196.58	3.32
					03/11/99	6.66	193.30	-3.28
					09/07/99	7.83	192.13	-1.17
					06/22/04	3.52	196.44	4.31
					08/29/05	6.87	193.09	-3.35
QMW13-I	2	34	24 - 34	194.24	08/16/95	6.12	188.12	NA
					02/04/97	5.32	188.92	0.80
					03/11/99	5.98	188.26	-0.66
					09/07/99	6.97	187.27	-0.99
					06/22/04	5.87	188.37	1.10
					08/29/05	5.34	188.90	0.53
QMW14	2	15	5 - 15	NS	08/16/95	4.24	NA	NA
					02/04/97	3.54	NA	NA
					03/11/99	3.96	NA	NA
					09/07/99	5.50	NA	NA
					06/22/04	2.85	NA	NA
					08/29/05	3.62	NA	NA
QMW15	2	15	5 - 15	NS	08/16/95	5.36	NA	NA
					02/04/97	4.58	NA	NA
					03/11/99	5.15	NA	NA
					09/07/99	6.17	NA	NA
					06/22/04	3.94	NA	NA
					08/29/05	4.63	NA	NA
QMW16	2	15	5 - 15	NS	08/16/95	4.40	NA	NA
					02/04/97	3.58	NA	NA
					03/11/99	4.08	NA	NA
					09/07/99	5.38	NA	NA
					06/22/04	2.90	NA	NA
					08/29/05	3.68	NA	NA
QMW17	2	16	6 - 16	201.49	08/16/95	6.84	194.65	NA
					02/04/97	6.81	194.68	0.03
					03/11/99	6.98	194.51	-0.17
					09/07/99	7.34	194.15	-0.36
					06/22/04	6.54	194.95	0.80
					08/29/05	6.65	194.84	-0.11
QMW18	2	14	4 - 14	199.03	02/04/97	5.15	193.88	NA
					03/11/99	5.46	193.57	-0.31
					09/07/99	6.54	192.49	-1.08
					06/22/04	3.60	195.43	2.94
					08/29/05	5.25	193.78	-1.65
QMW19	2	12	2 - 12	195.00	02/04/97	3.29	191.71	NA
					03/11/99	3.77	191.23	-0.48
					09/07/99	5.10	189.90	-1.33
					06/22/04	2.71	192.29	2.39
					08/29/05	3.66	191.34	-0.95
QMW20	2	14	4 - 14	197.08	02/04/97	5.55	191.53	NA
					03/11/99	5.88	191.20	-0.33
					09/07/99	7.17	189.91	-1.29
					06/22/04	5.42	191.66	1.75
					08/29/05	6.55	190.53	-1.13
QMW21	2	14	4 - 14	198.68	02/04/97	6.15	192.53	NA
					03/11/99	6.62	192.06	-0.47
					09/07/99	7.82	190.86	-1.20
					06/22/04	6.49	192.19	1.33
					08/29/05	6.55	192.13	-0.06

**Table 3-1**  
**Summary of Historical Groundwater Elevations at UST Site #1**  
 Fort Jackson, South Carolina

Well ID	Well Diameter (inches)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (ft msl) <sup>1</sup>	Date	Depth to Water (ft btoc)	Water Level Elevation (ft msl)	Change in Elevation (feet)
QMW22	2	12	2 - 12	193.25	02/04/97	3.65	189.60	NA
					03/11/99	9.02	184.23	-5.37
					09/07/99	9.95	183.30	-0.93
					06/22/04	8.89	184.36	1.06
					08/29/05	8.82	184.43	0.07
QMW22A	2	18	8 - 18	201.91	03/11/99	3.91	198.00	NA
					09/07/99	7.20	194.71	-3.29
					06/22/04	2.85	199.06	4.35
					08/29/05	3.58	198.33	-0.73
QMW23	2	16	6 - 16	197.21	09/07/99	5.93	191.28	NA
					09/07/99	4.97	192.24	0.96
					06/22/04	5.05	192.16	-0.08
					08/29/05	5.78	191.43	-0.73

ft bgs = feet below ground surface

NA = Not Available

ft btoc = feet below top of casing

NM = Not Measured

ft msl = feet above mean sea level

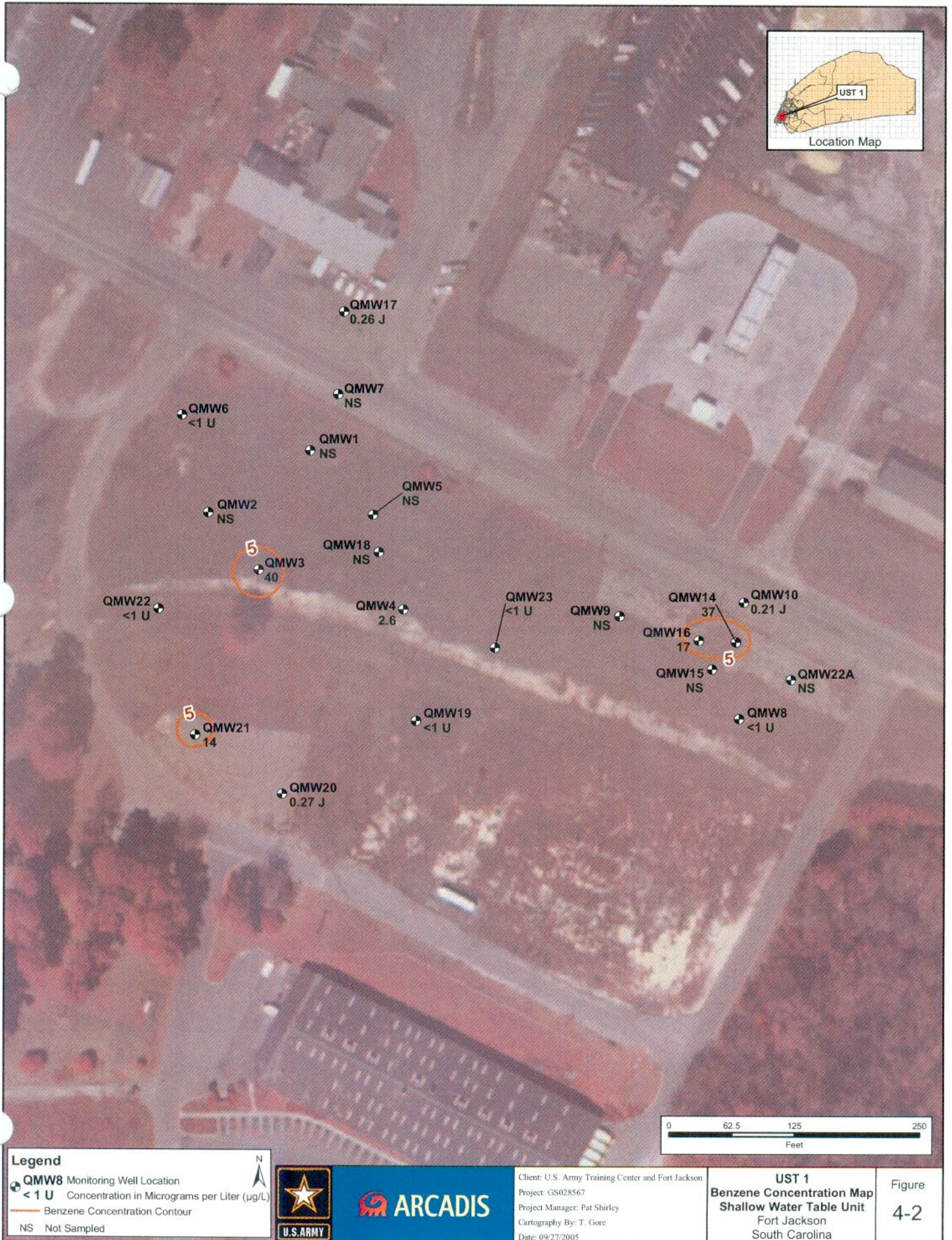
NS = Not Surveyed

<sup>1</sup>Elevations based upon MSL Datum (NGVD29) State Plane coordinates (NAD 83)

# APPENDIX

## GG







# APPENDIX

## HH



IMSE-JAC-ESP

25 August 2009

SUBJECT: Provost Marshal Office (PMO) Contract Briefing

FOR Contractors Working on Fort Jackson

1. The Directorate of Contracting Office (DOC) Contract Administrator notifies this office when initial contract briefings are scheduled for awarded contracts. The Physical Security Section of the Provost Marshal Office (PMO) then makes every effort to have a representative in attendance to brief you first hand on those items of interest to us and of importance to you; however, a personal briefing may not always be possible. This written briefing is designed to cover such situations.
2. EO 12989 as amended states: "Sec. 5. (a) Executive departments and agencies that enter into contracts shall require, as a condition of each contract, that the contractor agree to use an electronic employment eligibility verification system designated by the Secretary of Homeland Security to verify the employment eligibility of: (i) all persons hired during the contract term by the contractor to perform employment duties within the United States; and (ii) all persons assigned by the contractor to perform work within the United States on the Federal contract."
3. Fort Jackson Regulation 190-5, titled Motor Vehicle Traffic Supervision, contains ALL pertinent information regarding operation of motor vehicles on Fort Jackson. It may be reviewed in its entirety at the PMO Police Services Section located in the Emergency Services Center Building 5499, located on Jackson Boulevard, Monday thru Friday, 0730-1600 hours. The following pertinent data is extracted for you:
  - a. The vehicle laws of the State of South Carolina apply on post. Infractions such as speeding incur ticket/fine/points and such cases are handled thru the off-post U.S. Magistrate Court.
  - b. Vehicles must be mechanically safe. Tailgates must be installed/closed on trucks and care taken not to litter when transporting any material(s).
  - c. Construction traffic is prohibited within the housing areas unless absolutely necessary to perform the job. Vehicle/equipment operations require drivers to use extreme care near troop and other personnel movements including movements through school zones.
  - d. Speed Restrictions:
    - (1) 25 MPH unless otherwise posted.
    - (2) 10 MPH when passing marching troops or troops in formation.

- (3) 10 MPH in parking lots.
  - (4) 20 MPH in housing areas, hospital areas and school zones.
  - (5) 20 MPH through flashing yellow signal lights.
  - (6) 25 MPH on unpaved roads.
  - (7) 15 MPH when operating tracked vehicles.
- e. Stopping, Standing or parking laws-same as off post.
- f. Restraint systems must be worn by all drivers and riders in/on all vehicles on Fort Jackson if the vehicle is so equipped.
- g. The use of any hand held electronic device while driving on Fort Jackson is PROHIBITED. This includes cell phones, portable CD/DVD players, etc. To use these devices, you must pull over and park in an authorized parking area.
4. Construction sites must be secured at all times, as these sites are susceptible to criminal activity. Since construction site work normally requires workers on the job site Monday thru Friday, 0700-1800 hours, the Military Police (when on routine patrol) may stop and question people on site during other than normal hours, ascertain their right/need to being there and complete a Field Interview Card. HOWEVER, YOU should realize that YOU'RE ultimately responsible for the actions of your employees and the SECURITY of your job site/s. Items you need to consider:
- a. Control all keys to buildings and vehicles.
  - b. Access Control-who's on site (authorized/visitors).
  - c. Equipment-how accounted for/how secured after working hours.
  - d. Vehicles-keys, locked doors/steering.
  - e. Site Lighting-adequate for hours of darkness and operational.
  - f. Wearing of items of military apparel such as camouflage fatigues is prohibited.
  - g. NO ONE involved in any construction project on Fort Jackson is allowed to carry or transport any type of weapon or concealed weapon while on Fort Jackson.
5. You may contact the MPs on a 24-hour basis in Building 5499 (Emergency Services Center) on Jackson Boulevard by dialing 751-3113/3114/3115/3116 from a commercial phone or 4-3113/3114/3115/3116 from a Fort Jackson office phone. For emergencies on post dial 911 to get police, fire and ambulance services. If using a commercial phone (not a post 751 prefixed number), you'll get an off post 911 dispatcher and you'll need to explain that the emergency is on Fort Jackson and you'll be transferred to the 911 dispatcher on post..
6. All contractors (to include sub-contractors) must provide to the PMO Physical Security Section a listing of employees including full Name, Date of Birth, Place of Birth (City, County, State, Country), and Social Security Number prior to work start date. Names WILL be subjected to an MP Police Check and check of the Post Bar Roster. If work is to be performed in a sensitive area such as arms, ammunition and explosive areas, the contractor is responsible for requesting/paying for a State Law Enforcement Division (SLED) check of criminal history on ALL personnel, including Foreign Workers, providing the personal information listed above on company stationery to SLED

headquarters, and returning the Police Checks to the Directorate of Contracting. NO ONE barred from Fort Jackson or who has committed serious crimes such as felonies will be allowed to enter/work on post. Furthermore, IAW EO 12989 (9 June 2008), Contractors agree to use an electronic employment eligibility verification system designated by the Secretary of Homeland Security to verify the employment eligibility of: (i) all persons hired during the contract term by the contractor to perform employment duties within the United States; and (ii) all persons assigned by the contractor to perform work within the United States on the Federal contract. All Foreign Workers MUST possess all proper/legal paperwork for Identification/entry on post and must be a LEGAL Immigrant or have a worker's Visa.

7. Fort Jackson is a controlled access installation. All personal and company vehicles must be registered to enter post. All pertinent information regarding registration along with other pertinent information is included in the attachment.
8. Again, it is our intent that you will receive a personal briefing from a PMO Physical Security Representative. However, in those rare instances when personal contact is impossible due to prior commitments, this information is provided for your use. Please direct any questions you might have either in person or by calling the 24-hour location/phone #s listed above in para 4. You may also contact personnel assigned to the PMO Physical Security Section, located in Building 5499, at 751-2006/2005/6019/7076 directly or leave a voice mail message.

FOR THE PROVOST MARSHAL:

Attach: Vehicle Registration and other  
Helpful Information

Original Signed  
BYRON K. JONES  
Chief, Physical Security Section  
DAC, YC-02

## VEHICLE REGISTRATION AND OTHER HELPFUL INFORMATION

**AS OF 27 August 2008**

**Contractors:** IAW EO 12989 (9 June 2008), Contractors agree to use an electronic employment eligibility verification system designated by the Secretary of Homeland Security to verify the employment eligibility of: (i) all persons hired during the contract term by the contractor to perform employment duties within the United States; and (ii) all persons assigned by the contractor to perform work within the United States on the Federal contract.

Contractors must provide a letter on company letterhead addressed to the Directorate of Emergency Services/Provost Marshal Office, ATTN: Vehicle/Weapons Registration Section, giving the contract number, the expiration date of the contract, and sponsoring activity's endorsement. This letter should also state the name of the company representative who is authorized to register company vehicles, as well as the names of ALL employees of the company who will be required to enter the post to complete the requirements of the contract. If a subcontractor is required, the subcontractor's company name must be included. The primary contractor must notify the subcontractor that the above requirements must be completed for the subcontractor as well. In order to register a contractor company vehicle or a contractor's POV, the following current information is required in addition to the above letter: Vehicle Registration, Proof of Insurance, Drivers License, and endorsement from sponsoring activity. Temporary Passes will reflect the expiration date of the contract unless the contract exceeds one year, then the pass will expire 31 December of that calendar year and will have to be renewed each year until the contract is complete. The type of POV pass or decal is determined by the length of the contract; 6 months or less – Temporary Pass; More than 6 months – DOD contractor's decal; which will expire 31 December of every calendar year. **All contractors are responsible for removing decals from company vehicles when a contract is completed or terminated and turning them in to the Vehicle Registration Office. Decals on the vehicles of their employees must also be confiscated when the employee leaves or is terminated. These must also be turned in to the Vehicle Registration Office. Contractors ARE NOT AUTHORIZED to bring weapons onto Fort Jackson to include holders of concealed weapon permits issued by the state of South Carolina.** The Vehicle Registration Office is located in Room #114 of the Strom Thurmond Building #5450 located at the Intersection of Strom Thurmond Boulevard and Marion Avenue. Once vehicles have the proper registration, entry to the post can be gained thru Gates #1 (Fort Jackson Boulevard), Gate #2 (Forest Drive Boulevard), Gate #5 (Leesburg Road). Commercial vehicles and oversized vehicles/loads need to use Gate #4 (Percival Road and Boyden Arbor Road) as they cannot negotiate the barriers which are always in place at the other 3 gates and vehicle searches are conducted at Gate 4. Gates 4 and 5 are open 7 days a week. Gate 5 opens at 0445 hours AM and Gate 4 opens at 0500 hours AM. Both gates close at 2200 hours-10 PM. The 24 hour Military Police Station is located on Jackson Boulevard in Building #5499 at the intersection of Hill Street and Jackson Boulevard. For emergencies on-post dial 911 to get police, fire and ambulance services. If using your civilian access phone number, you'll get an off-post 911 dispatcher and you'll need to explain that the emergency is on-post (Fort Jackson) and you'll be transferred to the 911 dispatcher on-post.

# APPENDIX

## II

Fort Jackson required MNS messages.

Female voice should be used.

# 1 "Attention, Your attention please. The fire alarm in the building has been activated. Cease operations immediately. Proceed to the nearest exit and leave the building. Do not use the elevator". 3x's

# 2 "Attention, Your attention please. This is a tornado warning. Please seek shelter in an interior room and stay out of hallways and away from exterior windows". 3x's

# 3 "Attention, Your attention please. The National Weather Service has issued a severe thunderstorm warning for our area. 3x's

# 4 "Attention, attention. A bomb threat alert has been issued for this building. All personnel are to evacuate immediately using the nearest exit. Further instructions will be issued outside the building by emergency response teams." 3x's

# 5 "Attention, Your attention please. A hazardous material danger exists in the area. Remain in the building. **Please keep all doors and windows closed. Please wait for further instructions from Emergency services.** 3x's

# 6 "**May I have your attention, please. All clear. The emergency has ended.**" 3x's

# 7 "Attention, Your attention please. This is a test of the emergency audio system".

# 8 "Attention, Your attention please. An active shooter danger exists in the area. Remain in the building and proceed to a room that all doors and windows can be locked. Lie flat on the floor so no one is visible from outside the room. Call 9-1-1 to report your location. Do not respond to any voice commands until you can verify they are from Emergency services. 3x's

Mark S. Mallach  
Installation Antiterrorism Officer  
2464 Anderson St  
Module # 2, Room 2D  
Fort Jackson, SC 29207  
803-751-2132

Building #: \_\_\_\_\_

FORT JACKSON

Date: \_\_\_\_\_

Name: \_\_\_\_\_

## MASS NOTIFICATION INSPECTION CHECKLIST

Inspected by: \_\_\_\_\_

UFC 4-021-01 Design and O & M: Mass Notification Systems		Remarks	
	All amber strobes are operational.		
	PA System operational without resonating feedback.		
	All Local Operating Consoles are operational.		
	Messages correctly marked and in order.		
	Air Handler shut-off switch operational/Covered?		
	MNS will continue to run through FA notification		
Manual Activation	Remote Activation	Required Messages (Female Voice Only)	Remarks
		1. "Attention, Your attention please. The fire alarm in the building has been activated. Cease operations immediately. Proceed to the nearest exit and leave the building. Do not use the elevator". 3x's	
		2. "Attention, Your attention please. This is a tornado warning. Please seek shelter in an interior room and stay out of hallways and away from exterior windows". 3x's	
		3. "Attention, Your attention please. The National Weather Service has issued a severe thunderstorm warning for our area. 3x's	
		4. "Attention, attention. A bomb threat alert has been issued for this building. All personnel are to evacuate immediately using the nearest exit. Further instructions will be issued outside the building by emergency response teams." 3x's	
		5. "Attention, Your attention please. A hazardous material danger exists in the area. Remain in the building. Please keep all doors and windows closed. Please wait for further instructions from Emergency services. 3x's	
		6. "May I have your attention, please. All clear. The emergency has ended." 3x's	
		7. "Attention, Your attention please. This is a test of the emergency audio system".	
		8. "Attention, Your attention please. An active shooter danger exists in the area. Remain in the building and proceed to a room that all doors and windows can be locked. Lie flat on the floor so no one is visible from outside the room. Call 9-1-1 to report your location. Do not respond to any voice commands until you can verify they are from Emergency services." 3x's	

Friday, May 27, 2011

**Building #:** \_\_\_\_\_

**FORT JACKSON**

**Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**MASS NOTIFICATION INSPECTION CHECKLIST**

**Inspected by:** \_\_\_\_\_

**Inspected by:** \_\_\_\_\_ **Mark Mallach, Installation ATO, 803-751-2132**



# APPENDIX

## JJ

### Fort Jackson Antiterrorism Construction Standards Checklist

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. **The standards below are minimums set for DoD.**

Date:		Facility Name/Description:				Project No. (if assigned)	
Is This Facility New Construction?	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	If No, which "trigger" requires compliance with these standards?		
Is There a Controlled Perimeter?	Y	<input type="checkbox"/>	N	<input type="checkbox"/>	(See triggers below) An explanation of each can be found on the reverse of this checklist		
<b>TRIGGERS</b>							
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
MAJOR INVESTMENT	CONVERSION OF USE	GLAZING REPLACEMENT	BUILDING ADDITION	NEW/UPDATED LEASE	TEMPORARY STRUCTURE	NATIONAL GUARD BLDG	ON BASE TENANT
<b>SITE PLANNING – Standards 1 – 4</b>							
<b>STD</b>	<b>REQUIREMENT</b>	<b>YES</b>	<b>NO</b>	<b>N/A</b>	<b>COMMENTS/REMARKS/NOTES</b>		
<b>1</b>	<b>STANDOFF DISTANCES</b>						
1.1.	Is the facility located at least 148-ft from the installation perimeter?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<b>WITH A CONTROLLED PERIMETER</b>							
1.2.	Are parking lots and roadways located at least 82-ft away from the facility (billeting & primary gathering facilities)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
1.3.	Are parking lots and roadways located at least 33-ft away from the facility (inhabited facilities)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<b>WITHOUT A CONTROLLED PERIMETER</b>							
1.4.	Are parking lots and roadways located at least 148-ft away from the facility (billeting & primary gathering facilities)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
1.5.	Are parking lots and roadways located at least 82-ft away from the facility (inhabited facilities)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
1.6.	Are trash containers located at least 82-ft away from the facility (billeting & primary gathering facilities)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
1.7.	Are trash containers located at least 33-ft away from the facility (inhabited facilities)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
1.8.	If the answer to any of the above is "No", has dynamic analysis of the facility been completed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
<b>2</b>	<b>UNOBSTRUCTED SPACE</b>						
2.1.	Are there any obstructions within 33-ft of the facility that would allow for concealment from observation of explosive devices 150 mm (6 inches) or greater in height?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
2.2.	Are enclosures within the 33-ft unobstructed space closed on all four sides and the top?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
2.3.	Is the enclosure secured?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

<p><b>MAJOR INVESTMENT:</b> Implementation of these standards to bring an entire building into compliance is mandatory for all DoD building renovations, modifications, repairs, and restorations where those costs exceed 50% of the replacement cost of the building except as otherwise stated in these standards. The 50% cost is exclusive of the costs identified to meet these standards. Where the 50% threshold is not met, compliance with these standards is recommended.</p>
<p><b>CONVERSION OF USE:</b> Implementation of these standards is mandatory when any portion of a building is modified from its current use to that of an inhabited building, billeting, high occupancy family housing, or a primary gathering building for one year or more. Examples would include a warehouse (low occupancy) being converted to administrative (inhabited) use and an inhabited administrative building being converted to a primary gathering building or billeting.</p>
<p><b>GLAZING REPLACEMENT:</b> Because of the significance of glazing hazards in a blast environment, implementation of the glazing provisions of these standards is mandatory for existing inhabited buildings within any planned window or door glazing replacement project, regardless of whether that project meets the 50% cost trigger above. Such replacements may require window frame modification or replacement.</p>
<p><b>BUILDING ADDITIONS:</b> Inhabited additions to existing inhabited buildings will comply with the minimum standards for new buildings. If the addition is 50% or more of the gross area of the existing building, the existing building will comply with the minimum standards for existing buildings in Appendix B.</p>
<p><b>LEASED BUILDINGS:</b> DoD personnel occupying leased buildings deserve the same level of protection as those in DoD-owned buildings. Implementation of these standards is therefore mandatory for all facilities leased for DoD use and for those buildings in which DoD receives a space assignment from another government agency except as established below. This requirement is intended to cover all situations, including General Services Administration space, privatized buildings, and host-nation and other foreign government buildings. This requirement is applicable for all new leases executed on or after 1 October 2005 and to renewal or extension of any existing lease on or after 1 October 2009. Leases executed prior to the above fiscal years will comply with these standards where possible.</p> <p><b>Partial Occupancy.</b> These standards only apply where DoD personnel occupy leased or assigned space constituting at least 25% of the net interior useable area or the area as defined in the lease, and they only apply to that portion of the building that is occupied by DoD personnel.</p> <p><b>New Buildings.</b> Buildings that are built to lease to DoD as of the effective date established above will comply with the standards for new construction.</p> <p><b>Existing Buildings.</b> New leases or renewals of leases of existing buildings will trigger the minimum standards for existing buildings in accordance with the effective dates established above.</p>
<p><b>EXPEDITIONARY AND TEMPORARY STRUCTURES:</b> Implementation of these standards is mandatory for all expeditionary and temporary structures that meet the occupancy criteria for inhabited or primary gathering buildings or billeting. See Appendix D for structure types that meet the expeditionary and temporary structures criteria.</p> <p><b>New Structures.</b> These standards apply to all new expeditionary sites effective immediately.</p> <p><b>Existing Structures.</b> These standards will apply to all existing expeditionary activities beginning in Fiscal Year 2004. Prior to that fiscal year, existing expeditionary structures should comply with these standards where possible.</p>
<p><b>National Guard Buildings.</b> Any National Guard building that uses Federal funding for new construction, renovations, modifications, repairs, restorations, or leasing and that meets the applicability provisions above, will comply with these standards.</p>
<p><b>Tenant Buildings on DoD Installations.</b> Because buildings built by tenants on DoD installations may be taken over by DoD during their life cycles, memoranda of understanding or similar agreements between DoD components and tenants will require tenant-built buildings to comply with these standards, regardless of funding source. For the purposes of these standards, tenant-built building occupancies will be calculated assuming that building occupants are DoD personnel.</p>

<b>3</b>	<b>DRIVE-UP/DROP-OFF AREAS</b>				
3.1.	Are drive-up/drop-off areas properly marked?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.2.	Are procedures in place to preclude the unmonitored presence of vehicles in the drive-up/drop-off area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.3.	Is the drive-up/drop-off area located under any inhabited portion of the facility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>4</b>	<b>ACCESS ROADS</b>				
4.1.	Have controls been implemented to preclude unauthorized presence on access roads?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>STRUCTURAL DESIGN – Standards 5 – 9</b>					
<b>STD</b>	<b>REQUIREMENT</b>	<b>YES</b>	<b>NO</b>	<b>N/A</b>	<b>COMMENTS/REMARKS/NOTES</b>
<b>5</b>	<b>PARKING BENEATH BUILDINGS OR ON ROOFTOPS</b>				
5.1.	Has parking been precluded on the rooftops and under the facility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>6</b>	<b>PROGRESSIVE COLLAPSE AVOIDANCE</b>				
6.1.	Are all exterior, vertical load-carrying columns and walls able to sustain a loss of lateral support at any of the floor levels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

6.2.	Can the facility withstand a removal of one primary exterior vertical or horizontal load-carrying element without progressive collapse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6.3.	Are floors designed to withstand a net uplift equal to the dead load plus one-half the live load?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>7</b>	<b>STRUCTURAL ISOLATION</b>				
	<b>BUILDING ADDITIONS</b>				
7.1.	Are building additions structurally independent from adjacent existing buildings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7.2.	If not, has analysis been completed which shows collapse of either the addition or the existing building will not result in collapse of the remainder of the building.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<b>PORTIONS OF BUILDINGS</b>				
7.3.	Are low occupancy areas of inhabited facilities designed structurally independent of the inhabited areas?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>8</b>	<b>BUILDING OVERHANGS</b>				
8.1.	Are restrictions in place to preclude parking or other vehicle travel under overhangs?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.2.	Are floors of inhabited areas above overhangs designed to prevent failure from the detonation of an explosive weight II?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.3.	Is the superstructure within and adjacent to the overhang designed to the specifications in Standard 6?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8.4.	Do all building elements adjacent to the overhang area provide the appropriate level of protection to explosive weight II?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>9</b>	<b>EXTERIOR MASONRY WALLS</b>				
9.1.	Do all external masonry walls have vertical and horizontal reinforcement distributed throughout the wall section?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9.2.	Is the vertical reinforcement ratio at least 0.05%, spaced no more than 1200 mm (4 ft) with reinforcement within 410 mm (1.3 ft) of the ends of walls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
9.3.	Is the horizontal reinforcement ratio at least 0.025%, consisting of either joint reinforcement spaced no more than 410 mm (1.3 ft), or bond beam reinforcement spaced no more than 1200 mm (4 ft), with reinforcement within 410 mm (1.3 ft) of the top and bottom of the wall?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

ARCHITECTURAL DESIGN – Standards 10 – 15					
STD	REQUIREMENT	YES	NO	N/A	COMMENTS/REMARKS/NOTES
<b>10</b>	<b>WINDOWS AND SKYLIGHTS</b>				
10.1.	Are all exterior windows and/or skylights at least 6-mm (1/4-in) laminated glass consisting of two nominal 3-mm (1/8-in) annealed glass panes bonded together with a minimum of a 0.75-mm (0.030-inch) polyvinyl-butylal (PVB) interlayer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10.2.	Are window and skylight frames created from aluminum or steel?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10.3.	Do framing members restrict deflections of edges of the blast resistant glazing they support to 1/160 of the length of the supported edge at allowable stress levels under the equivalent 3-second design loading?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
10.4.	<i>(Leased Facilities)</i> Do window retrofits (e.g. fragment retention film or blast curtains) provide an equivalent level of protection as laminated windows?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>11</b>	<b>BUILDING ENTRANCE LAYOUT</b>				
11.1.	<i>(New Bldgs)</i> Does the main entrance to the facility face away from the perimeter or other uncontrolled vantage points with direct lines of sight?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>12</b>	<b>EXTERIOR DOORS</b>				
12.1.	Do all exterior doors open outwards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12.2.	Does glazing in doors meet the glazing and frame bite provisions of Standard 10?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
12.3.	Are doors positioned such that they will not be propelled into rooms if they fail in response to a blast?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>13</b>	<b>MAIL ROOMS</b>				
13.1.	Is the mail room located on the perimeter of the facility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13.2.	Is the mail room located away from heavily populated portions of the facility?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13.3.	Is the mail room well sealed between its envelopes and other portions of the building?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13.4.	Are mail room walls of full height construction that fully extends and is sealed to the undersides of the roof, floor above them, or to hard ceilings (i.e. gypsum wallboard ceiling)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

13.5.	Do doors have weather stripping on all four edges?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>14</b>	<b>ROOF ACCESS</b>				
14.1.	<i>(New Bldgs)</i> Has roof access been limited to controlled internal access?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
14.2.	<i>(Existing Bldgs)</i> Has exterior roof access been secured with a locked cage or similar mechanism?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>15</b>	<b>OVERHEAD MOUNTED ARCHITECTURAL FEATURES</b>				
15.1.	Are overhead-mounted features weighing 31-lbs or more mounted to resist forces of 0.5 times their weight in any horizontal direction and 1.5 times their weight in the downward direction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>ELECTRICAL AND MECHANICAL DESIGN – Standards 16 – 22</b>					
<b>STD</b>	<b>REQUIREMENT</b>	<b>YES</b>	<b>NO</b>	<b>N/A</b>	<b>COMMENTS/REMARKS/NOTES</b>
<b>16</b>	<b>AIR INTAKES</b>				
16.1.	Are outside air intakes located at least 10-ft above the ground?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>17</b>	<b>MAIL ROOM VENTILATION</b>				
17.1.	Does the mail room have a separate, dedicated air ventilation system?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17.2.	Does the mail room have a dedicated exhaust system?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17.3.	Does the mail room have ventilation system outside air intakes, relief air, and exhausts with low leakage isolation dampers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17.4.	Can they be automatically closed to isolate the mail room?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
17.5.	Do the low leakage dampers have a maximum leakage rate of 3 cfm/sq foot with a differential pressure of 1 in. of water gage across the damper?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>18</b>	<b>EMERGENCY AIR DISTRIBUTION SHUTOFF</b>				
18.1.	Does the facility have an emergency shutoff switch in the HVAC control system that can immediately shut down the air handling system throughout the building?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18.2.	Is the switch(s) located where they are easily accessible by the facility management?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18.3.	Do all outside air intakes have relief air, and exhaust openings with low leakage dampers that are automatically closed when the emergency air distribution shutoff switch is activated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

18.4.	Do the low leakage dampers have a maximum leakage rate of 3 cfm/sq-ft with a differential pressure of 1" of water gage across the damper?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
18.5.	Do critical area air handling units close with low leakage isolation dampers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>19</b>	<b>UTILITY DISTRIBUTION AND INSTALLATION</b>				
19.1.	Are critical or fragile utilities routed so that they are not on exterior walls or on walls shared with mail rooms?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19.2.	Where required, are redundant utilities run in separate chases?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
19.3.	Where required, are emergency backup systems located away from the system components for which they provide backup?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>20</b>	<b>EQUIPMENT BRACING</b>				
20.1.	Are all equipment mountings designed to resist forces 0.5 times the equipment weight in any horizontal direction and 1.5 times the equipment weight in the downward direction?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>21</b>	<b>UNDER BUILDING ACCESS</b>				
21.1.	Are crawl spaces, utility tunnels, and other means of under building access controlled?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>22</b>	<b>MASS NOTIFICATION</b>				
22.2.	Does the capability exist to provide real-time info to building occupants during emergency situations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

# APPENDIX

## KK





**Palmetto State**  
**Utility Services, Inc.**

A Subsidiary of American States Utility Services, Inc.

**Revision: 27 May 2009**

## **Wet Utility SOPs (DRAFT)**

Standard Operating Procedures for the water and wastewater systems on Fort Jackson

**Reference:** Contract SP0600-07-C-8251

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PSUS – Wet Utility SOPs (DRAFT)

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1. **Points of Contact:**

- a. Palmetto State Utility Services, Inc. (PSUS)
  - i. David R. Wiman, Utility Manager: 803-790-7288, [dwiman@psus.asusinc.com](mailto:dwiman@psus.asusinc.com)
  - ii. Joey Williams, Project Engineer: 803-790-7288, [jwilliams@psus.asusinc.com](mailto:jwilliams@psus.asusinc.com)
  - iii. PSUS On-Call representative: 803-394-0966.
- b. Contract Officer Representative (COR) – Carlos Alexander: 803-751-1069, [carlos.alexander@us.army.mil](mailto:carlos.alexander@us.army.mil)

2. **Important Information**

- a. Palmetto State Utility Services, Inc. (PSUS) owns the water and wastewater systems. As the owner of the water and wastewater infrastructure, PSUS will perform or approve all work on and any connections to/ disconnects from their systems.
- b. No one may operate valves, hydrants, or other appurtenances to the water or sewer systems without express approval from PSUS.
- c. Please contact the COR anytime a customer may have contract questions, need additional guidance, or have feedback on the PSUS contract performance.
- d. Points of demarcation
  - i. Water distribution system – generally speaking, it is the point on the downstream side of the last apparatus (backflow preventer, valve, etc.) or at the five foot line from a structure, whichever is closest to the structure. Please see Appendix A for more detail.
  - ii. Wastewater collection system – generally speaking, it is the mid-point of a dual clean-out, the upstream side of a single clean-out or the five foot line from the structure, whichever is closest to the structure. Please see Appendix B for more detail.

3. **Service Requests:**

- a. Call 803-751-7684 (Fort Jackson Service Order Desk). For documentation purposes, **all service requests**, including **any water quality concerns**, should be made through the Fort Jackson service order system. Please provide details including a point of contact (POC) and their immediate contact information.
- b. During duty hours (0700 – 1600), the service order clerks will contact PSUS. After duty hours, the Ft. Jackson EOC will answer the service request calls and contact PSUS.
- c. The priority level of the service request will be set by the gov't, using the following:
  - i. **P1** = Emergency – life threatening or serious injury hazard, imminent loss/damage to gov't property or the loss of essential services exists;
  - ii. **P2** = Urgent – will soon inconvenience and/or affect security, health or well being;
  - iii. **P3** = Routine – does not pose an immediate threat to public health, safety or property;
  - iv. **P4** = Other – the work is not classified as maintenance or repair, but is required to satisfy the requester's needs.
- d. Initial response times (communication or arrival) should be as follows:
  - i. **P1** – will be responded to within an hour, crews onsite within 2 hours;
  - ii. **P2** – will be responded to within 24 hours;
  - iii. **P3 & P4** – will be responded to in less than five days.

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- e. If you have not been contacted by a PSUS employee or PSUS has not arrived on the scene within a half hour of calling the Service Order Desk about a P1 or P2 situation, call the PSUS on-call representative directly at 803-394-0966.
- f. Work completion will be estimated by the crews based on the particulars of the specific task but may be generalized as follows:
  - i. **P1** – as soon as possible;
  - ii. **P2** – within five working days;
  - iii. **P3 & P4** – within thirty working days.

**4. Line Locates, Construction Permits and Record of Environmental Consideration****a. Line Locates (Dig Permits)**

- PSUS is an active participant in the Ft. Jackson DPW dig permit process. To obtain a dig permit request along with the associated installation requirements, email Butch Ridgeway at [irvin.ridgeway@us.army.mil](mailto:irvin.ridgeway@us.army.mil) or stop by the DPW building (2601) and see him in person. When submitting the locate request, it would be helpful to include a map or drawing clearly identifying the dig area boundaries.
- The completed dig permit will be returned by Ft. Jackson DPW.
- Wet utility locates are completed within three working days from the time they are received. PSUS will respond to emergency locates within two hours. Please note that by South Carolina law, in order for an emergency to exist there must be “a substantial likelihood that loss of life, health or property will result (within three working days).”
- Any wet utility repair necessitated by damage done to a line that lies within two and one half feet of the temporary utility mark will be completed by PSUS at the expense of the contractor.
- Call PUPS (Public Utility Protection Service) at 888-721-7877.

**b. Construction Permits**

- Before the construction, expansion or modification of any wet utility system can begin, an application for a permit to construct shall be made to, and a permit to construct obtained from, the South Carolina Department of Health and Environmental Control (DHEC). This request shall include:
  - 1) a letter from PSUS stating our willingness and ability to serve the project;
  - 2) a letter from PSUS acknowledging that we will be accepting the O&M responsibilities.
- The complete requirements for obtaining construction permits can be found as follows:
  - Water per SC R61-58 State Primary Drinking Water Regulation, part 58.1 B(1)
  - Wastewater per SC R61-67 Standards for Wastewater Facility Construction, part 67.300, p.1

**c. Record of Environmental Consideration**

- To initiate the Fort Jackson environmental review process required by the National Environmental Policy Act, a completed Record of Environmental Consideration (REC) form must be submitted to the Fort Jackson, DPW, Environmental Division (ED) for all projects involving new construction, demolition or renovation. A copy of the REC form can be found at <http://www.jackson.army.mil/ENRD/emb/nepa.htm>.

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- A REC does not need to be submitted for routine maintenance projects.
- For additional information on the REC process, please call Patrick Metts, (803) 751-4078, in the Fort Jackson ED.

**5. Construction Standards**

- a. PSUS Technical Pipeline Installation Specifications, Potable Water Material Guidelines and Standard Construction Drawings – dated 16 March 2009, are the DHEC & Post approved documents that govern all work to the wet utility systems at Fort Jackson.
  - The standards and specs can be requested by contacting PSUS directly.
  - The standards and specs are also on file with the USACE, Ft. Jackson DPW and South Carolina Department of Health and Environmental Controls (DHEC).
- b. PSUS standards prevail in any conflict unless otherwise approved in writing by the PSUS Utility Manager or PSUS Project Engineer.

**6. Wet Utility Work performed by PSUS**

- a. Complete a Request For Action (RFA) for **all** projects. See Appendix C.
- b. As owner of the wet utility systems, PSUS is solely responsible for the work completed on its systems. PSUS will design the project based on the supplied scope of work. PSUS is responsible to correct at their cost any deficiencies with their design or construction.
- c. The Installation reserves the right to postpone any work it feels may adversely affect its operations and/or require that this work be performed after normal working hours.

**7. Wet Utility Work performed by others****a. Preparatory Phase**

- i. Complete a Request For Action (RFA) for **all** projects. See Appendix C.
- ii. Obtain and have on file all required permits. See section 4 for more detail.
- iii. Provide the following to PSUS no later than 30 days prior to the commencement of construction: all material & equipment submittals, design plans, design calculations and a formal maintenance of operations plan, as defined herein. All should be associated with the wet utilities project and approved by the design engineer.
  - 1) A Maintenance of Operations Plan (MOP) at a minimum, should detail the construction phases; show locations of isolation valves required for shutdown; indicate continuity of service to downstream (water) or upstream (sewer) facilities and the associated remaining capacities; provide calculations or modeling results showing required capacities are met; and provide a schedule of needed shutdowns.
  - 2) Compliance with the Government's "Buy America" requirement is a necessity.

**b. New Connection & Service Interruption Procedures**

- i. PSUS scheduling of any new connections or required water or sewer service shutdowns is dependent on receiving the MOP.

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- ii. Provide a minimum of 14 days advance notice to PSUS prior to the desired date for new connections to the existing facilities or for service shutdowns. This will allow PSUS the time necessary to conduct trial shutdowns for isolation of the existing facilities.
- iii. Perform all work relating to water and sewer in the presence of a PSUS representative (see: c. iii)
- iv. Provide a minimum of 48-hour notice to PSUS before cleaning, flushing and pressure testing new water/sewer pipelines and sanitary sewer manholes. Testing shall be conducted in accordance with Section 7 of the PSUS Technical Pipeline Specifications.
- v. Provide a minimum of 48-hour notice to PSUS before conducting disinfection of new potable water lines. Disinfection shall be completed in accordance with Section 8 of the PSUS Technical Pipeline Specifications.

**Note:** As soon as a valve is connected to the PSUS system, it shall be operated by PSUS crews only.

### c. Inspection Requirements

- i. Water and sewer infrastructure construction shall be inspected by PSUS inspectors. The cost of this inspection shall be covered by the contractor performing the work and will be determined by the length of time spent on wet utility work. See section 8 below.
- ii. Water and sewer material deliveries may be inspected by PSUS prior to installation to determine if materials are in accordance with those specified in PSUS standard drawings and specifications.
- iii. Contractor to provide 48-hour notice to PSUS prior to conducting any water and/or sewer work including pipeline and appurtenances installations, service connections, backfilling of structures, pressure testing, disinfection, pouring of thrust blocks, abandonments, application of protective coatings and as otherwise required in the PSUS Technical Pipeline Specifications.  
**Note: failure to provide this notification may result in the requirement for contractor to expose such work for confirmation of compliance.**
- iv. Immediately notify PSUS of any change to the project schedule.
- v. Provide schedule of regular progress meetings. PSUS may attend these meetings as required. Provide 48-hour notice to request PSUS attendance at a meeting.

### d. Post Construction Close-out

**Note:** the items outlined in this section shall be arranged and/or coordinated by the contractor as best suits their overall project schedule & requirements, but **must** be completed **prior** to the associated wet utilities being placed in service.

- i. Pre-Final Acceptance Inspection – A pre-final job walk, scheduled at least 48 hours in advance, is required for all non-buried infrastructure for generation of punch list items.
- ii. Provide all test results and the Permit to Operate, issued by DHEC (as required), to PSUS upon request for activation of new services.
- iii. Required operation and maintenance data include, but are not limited to sub-sections a. – h. below. This data should be clearly identifiable with the project it is associated with including the Government project number.
  - a. **Equipment Summary.** The contractor shall provide a list that details each item of mechanical, electrical and instrumentation equipment installed at the facility.

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- b. **Mechanical Operational Procedures.** The contractor describes mechanical operational procedures for all installed equipment, as appropriate, including installation instructions, adjustment, startup, operation, load changes, calibration, shutdown, troubleshooting, disassembly, reassembly, realignment and testing.
- c. **Preventive Maintenance Procedures and Schedules.** The contractor provides two (2) copies of the preventive maintenance procedures and schedules based on Manufacturer's recommendation for the environment of use for all installed equipment. The procedures shall cover, but not be limited to periodic inspection, lubrication and calibration schedules as well as the maintenance that can be performed in place or will require removal.
- d. **Parts List.** The contractor provides a complete parts list for all installed equipment, including a list of recommended spare parts for two years of continuous operation, a generic description and identification number for each part, addresses and telephone numbers of vendors from whom parts can be purchased, and cross-sectional or assembly-type drawings. Any instructions, parts lists or other items packed with or attached to the equipment when delivered shall also be provided.
- e. **Wiring Diagrams.** The contractor provides complete internal and connection wiring diagrams for each installed component, if applicable.
- f. **Machine Shop Fabrication Drawings.** The contractor provides approved machine shop fabrication drawings, complete with dimensions, for all installed components.
- g. **Safety.** The contractor provides the safety instructions and precautions recommended by the manufacturer to be taken when working on all installed equipment items.
- h. **Documentation.** The contractor provides all warranties, affidavits and certifications required for all installed equipment items. The contractor provides two hard copies of the as-built plans/record drawings and electronic copies in PDF and Auto CAD format.
- iv. Start-Up, Training and Testing on any system component, such as a potable water pump station or sewage lift station, shall not occur until the contractor's submittal of Operation and Maintenance Information has been incorporated into project O & M Manuals by the Design Consultant, the contractor's Lesson Training Plans are approved by PSUS, and the approved Operation and Maintenance Manuals have been turned over to PSUS. Requirements are as follows:
  - a. Start-up Plan:
    - 1. Provide a Systems Start-up Plan addressing all aspects of this Section for acceptance not less than 15 calendar days prior to start-up.
    - 2. The Systems Start-up Plan is the responsibility of the contractor who is solely responsible for its means, methods, techniques, sequences, procedures, coordination, completeness, accuracy, and validity.
    - 3. Identify each person or organization that will have a functional part in the start-up, and identify their duties and responsibilities.
    - 4. Provide contingency plans for operational failure modes.
  - b. Validation procedures: Provide a complete written description of each test, simulation, and start-up, including:
    - 1. Schedule.

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2. Listing of components included.
3. Listing of individuals or organizations involved and assigned responsibilities.
4. Test equipment required, accuracy, and calibration information.
5. Detailed listing of procedures necessary to demonstrate compliance with performance requirements specified in this Section and the technical Sections.
- d. Validation reports: Provide certified validation reports indicating compliance with the requirements of this Section for PSUS certification.
- e. Provide operations and maintenance training to PSUS staff for all new mechanical infrastructures. Note: PSUS normally requires 7 days notice prior to any scheduled training.
- f. Submit all warranty documentation.
- v. Final Acceptance Inspection - 48 hour notice prior to final job walk required for all non-buried infrastructure.

### e. Temporary Water Service

- i. Temporary Hydrant Service
  - a. For temporary water service from a hydrant, complete a PSUS Temporary Water Service Request. See Appendix D. Along with this request submit a location map of the areas where service is being requested. Maps can be obtained at the PSUS office. **Note:** for temporary service to a construction trailer, see: sub-section ii.
  - b. Once the payment terms (sec. iii) are satisfied, PSUS will issue a Water Hydrant Permit to the contractor and install the backflow preventer (bfp) and construction meter at each hydrant location requested. **This permit terminates one year from date of issuance** (see the note in section iii. 2, below.)
  - c. Only PSUS utility operators are allowed to connect/disconnect the bfp assembly from the hydrant. Any change in location request must be communicated to PSUS via a service order.
- ii. Request of Temporary Water/Sewer Service to a Construction Office/Trailer
  - a. Submit a request for service via the Fort Jackson Service Order system (803-751-7684).
  - b. Follow up with a direct request to PSUS for service; this should include a location map of the areas where service is being requested.
  - c. PSUS will provide the contractor with a cost proposal to provide the service connection(s).
- iii. Payment(s):
  - 1) For use of a hydrant, contractor will be required to submit two checks to PSUS in the amounts of \$300 (annual service charge) and \$1200 (for deposit). The deposit check will be returned upon the return in good working order of the equipment (bfp, meter, etc.) The service charge may be paid by credit card, but would include a 5% transaction fee. **Note:** an additional \$300 check will be required to receive a Water Hydrant Permit renewal if the project runs longer than a year. At the time of payment PSUS will issue the new permit and install a currently certified bfp.
  - 2) Upon the contractor's written acceptance of the proposal mentioned in section ii. c. above, to include a PO # or payment, PSUS will proceed with scheduling the work. The cost of abandoning the temporary connection will be via a separate proposal.

**PSUS – Wet Utility SOPs (DRAFT)**

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**8. Wet Utility Costs to Others**

- a. **Temporary Services** – see section e. iii. above.
- b. **Tap Fees** – these fees are for the physical tapping of the water and/or sewer mains. See Appendix E for cost breakdown.
- c. **New Project Fees** - charges are based on the costs incurred for engineering plan review, operational evaluation of the project's impact on the wet utility systems and necessary operational support. Current rates: Engineer @ \$120/hour; Utility Operator @ \$45/hour, Admin. Asst. @ \$30/hour. The number of hours is determined on a project by project basis as set by the wet utility construction schedule. Any additional costs incurred by PSUS due to specific needs of the project will be the responsibility of the contractor.
- d. **Inspection Fees** – covers the cost of PSUS to inspect to inspect any wet utility work performed by others. Current rate: Inspector @ \$100/hour. The number of hours is based on the wet utility construction schedule for the project. If the actual inspection hours go beyond the schedule provided, the contractor will be responsible for the additional costs incurred by PSUS.
  - This fee is waived when PSUS provides the wet utility construction.

**9. Lessons Learned**

- a. PSUS must participate in the preliminary pre-design or pre-construction meetings, including site visits. This will expedite the process and insure a smoother project timeline and support.
- b. Include the proper language and pricing in the prime contractor's contract.
- c. Call the COR with any contract questions, if additional guidance is required, or if you have a positive or negative comment regarding PSUS.



## PSUS – Wet Utility SOPs (DRAFT)

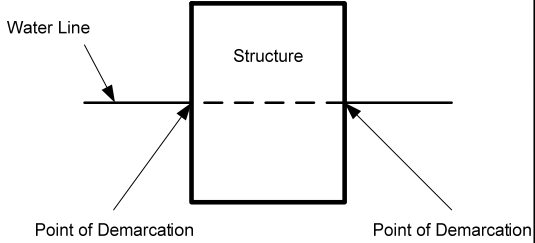
## APPENDIX A

### WATER DISTRIBUTION SYSTEM POINTS OF DEMARCATION

SCENARIO	POINT OF DEMARCATION	VISUAL REPRESENTATION
Residential Service	Point where the downstream side of the facility cutoff valve. (If there is not a cutoff valve, the POD is a point 5 feet from the building footprint.)	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service line extends from the structure to the right, where it meets a vertical line representing the distribution line. A valve symbol is located on the service line. An arrow points to the downstream side of this valve, labeled 'Point of Demarcation'. The entire line between the structure and the distribution line is labeled 'Service Line'. The distribution line is labeled 'Distribution Line' with an arrow pointing right. The valve is labeled 'Cutoff Valve'.</p>
Where the service line enters the building	Point where the downstream side of the meter, BPD, or valve (whichever is closest to the building) that is within 5 feet of the building exterior. <i>Note: PRVs are included or are to be in the location of the BPD</i>	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service line extends from the structure to the right, where it meets a vertical line representing the distribution line. A valve symbol is located on the service line. An arrow points to the downstream side of this valve, labeled 'Point of Demarcation'. The distance between the structure and the point of demarcation is indicated as '5 Ft. Boundary'. The entire line between the structure and the distribution line is labeled 'Service Line'. The distribution line is labeled 'Distribution Line' with an arrow pointing right. The valve is labeled 'Valve'.</p>
Where the service line enters the building and no valve exists within 5 feet of the building footprint.	Point where the five-foot line exterior to building footprint. <i>Note: Service valve may be installed at or within 5 feet of the structure at any time. Downstream side of service valve would then become the point of demarcation.</i>	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service line extends from the structure to the right, where it meets a vertical line representing the distribution line. A valve symbol is located on the service line. An arrow points to the downstream side of this valve, labeled 'Point of Demarcation'. The distance between the structure and the point of demarcation is indicated as '5 Ft. Boundary'. The entire line between the structure and the distribution line is labeled 'Service Line'. The distribution line is labeled 'Distribution Line' with an arrow pointing right. The valve is labeled 'Valve'.</p>
Irrigation system fed directly from distribution system or backflow prevention device exists on the service line entering the structure.	Point where the downstream side of the backflow prevention device or service valve.	<p>The diagram shows a rectangular structure on the left, labeled 'Irrigation System'. A horizontal line representing the service line extends from the structure to the right, where it meets a vertical line representing the distribution pipe. A valve symbol is located on the service line. An arrow points to the downstream side of this valve, labeled 'Point of Demarcation'. The entire line between the structure and the distribution pipe is labeled 'Service Line'. The distribution pipe is labeled 'Distribution Pipe' with an arrow pointing right. The valve is labeled 'Backflow Device or Service Valve'.</p>
City of Columbia water delivery points.	Point where the upstream side of the Army-owned meters.	None

## PSUS – Wet Utility SOPs (DRAFT)

## APPENDIX A (continued)

SCENARIO	POINT OF DEMARCATION	VISUAL REPRESENTATION
Non-residential service, appurtenance is located inside the building in a mechanical room. <i>Note: Point of demarcation may change as Contractor-owned components are moved outside.</i>	Point where the downstream side of interior water meter, backflow prevention device, or valve (whichever is farther downstream of the appurtenance yet still inside the mechanical room).	None
Water distribution pipe buried inside building footprints.	Points where the pipe enters and exits the building footprint. (Government will retain ownership of the pipe segments until such time as these segments are relocated.)	
Isolated potable water fixtures (outside fountains, yard hydrants, spigots, etc.).	Point where the downstream side of the first upstream appurtenance from the fixture (i.e., valve or backflow device).	None

## PSUS – Wet Utility SOPs (DRAFT)

## APPENDIX B

### WASTEWATER COLLECTION SYSTEM POINTS OF DEMARCATION

SCENARIO	POINT OF DEMARCATION	VISUAL REPRESENTATION
Clean out located within 5 feet of structure wall	Upstream side of clean out	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service lateral extends from the structure to a vertical line on the right representing the sewer main. A small circle labeled 'Clean Out' is located on the service lateral, closer to the structure. A dashed vertical line labeled 'Point of Demarcation' is positioned at the clean out. Arrows point to the 'Sewer Main', 'Service Lateral', 'Clean Out', and 'Point of Demarcation'.</p>
Grease trap located within 5 feet of structure wall	Upstream side of grease trap	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service lateral extends from the structure to a vertical line on the right representing the sewer main. A rectangle labeled 'Grease Trap' is located on the service lateral, closer to the structure. A dashed vertical line labeled 'Point of Demarcation' is positioned at the grease trap. Arrows point to the 'Sewer Main', 'Service Lateral', 'Grease Trap', and 'Point of Demarcation'.</p>
Clean out not located within 5 feet of structure wall	5 feet from structure wall	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service lateral extends from the structure to a vertical line on the right representing the sewer main. A small circle labeled 'Clean Out' is located on the service lateral, further from the structure. A dashed vertical line labeled 'Point of Demarcation' is positioned 5 feet from the structure wall. A dimension line indicates '5 feet' from the structure wall to the point of demarcation. Arrows point to the 'Sewer Main', 'Service Lateral', 'Clean Out', and 'Point of Demarcation'.</p>
Grease trap not located within 5 feet of structure wall	5 feet from structure wall	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service lateral extends from the structure to a vertical line on the right representing the sewer main. A rectangle labeled 'Grease Trap' is located on the service lateral, further from the structure. A dashed vertical line labeled 'Point of Demarcation' is positioned 5 feet from the structure wall. A dimension line indicates '5 feet' from the structure wall to the point of demarcation. Arrows point to the 'Sewer Main', 'Service Lateral', 'Grease Trap', and 'Point of Demarcation'.</p>
No sewer apparatus located within 5 feet of structure wall  NOTE: If no clean out exists on service lateral, contractor shall install a clean out within 5 feet of structure wall when required to work on the service lateral	5 feet from structure wall	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service lateral extends from the structure to a vertical line on the right representing the sewer main. No sewer apparatus is shown on the service lateral within 5 feet of the structure. A dashed vertical line labeled 'Point of Demarcation' is positioned 5 feet from the structure wall. A dimension line indicates '5 feet' from the structure wall to the point of demarcation. Arrows point to the 'Sewer Main', 'Service Lateral', and 'Point of Demarcation'.</p>

## PSUS – Wet Utility SOPs (DRAFT)


## APPENDIX B (continued)

SCENARIO	POINT OF DEMARCATION	VISUAL REPRESENTATION
Multiple sewer apparatus located on service lateral within 5 feet of structure wall	Upstream side of apparatus closest to structure wall	<p>The diagram shows a rectangular structure on the left. A horizontal line representing the service lateral extends to the right. On this line, there is a circle labeled 'Clean out' and a rectangle labeled 'Grease Trap'. A vertical line labeled 'Sewer Main' is on the far right. A dashed vertical line labeled 'Point of Demarcation' is positioned between the structure and the clean out. A double-headed arrow indicates the distance between the structure wall and the point of demarcation.</p>
Multiple sewer apparatus located on service lateral, none within 5 feet of structure wall	5 feet from structure wall	<p>The diagram is similar to the first one, but the 'Point of Demarcation' (dashed line) is further to the right, such that the distance between the structure wall and the point of demarcation is labeled '5 feet' with a double-headed arrow.</p>
Grease Trap not connected to sanitary sewer system	5 feet from structure wall or inflow side of grease trap, whichever is closest to structure wall	<p>The diagram shows a structure on the left and a grease trap on the service lateral to its right. A dashed vertical line labeled 'Point of Demarcation' is positioned between the structure and the grease trap. A double-headed arrow indicates the distance between the structure wall and the point of demarcation, labeled '5 feet'.</p>
Collection line under existing structure	Point where collection line enters and exits structure footprint	<p>The diagram shows a rectangular structure. A horizontal line labeled 'Sewer Line' passes through the structure. Two dashed vertical lines, both labeled 'Point of Demarcation', are positioned at the left and right edges of the structure where the sewer line enters and exits.</p>

## PSUS – Wet Utility SOPs (DRAFT)

## APPENDIX C

### PSUS REQUEST FOR ACTION (RFA)



**Palmetto State**  
Utility Services, Inc.  
A Subsidiary of American States Utility Services, Inc.

**REQUEST FOR ACTION (RFA)**  
**SP0600-07-C-8251 – Ft. Jackson, SC**

**RFA No.** xx-09 **Date:** xx/xxxx 2009

**Project Description:** xx

**Location:** xx **Work Order/Line Item No.:** xx

**Funding Source:** xx

**Points of Contact (knowledgeable of this effort):**

Customer	PSUS
<b>Name:</b> <u>xxx</u>	<b>Name:</b> <u>xxx</u>
<b>Telephone No.</b> <u>xxx-xxxx</u>	<b>Telephone No.</b> <u>xxx-xxxx</u>
<b>Email:</b> <u>xxxx</u>	<b>Email:</b> <u>xxxx</u>

**Scope of Work:** (if more than one page add additional pages) **Sketch Included:** Yes or No

1 - Do not exceed 6 lines of type at 10 point.

2

3

4

5

6

**Cost of Action** (as listed in the 1391 form or equivalent): \$

**Approved 1391 & any other cost support attached:** Yes or No

**Start Date:** xx **End Date:** xx **or** **Period of Performance:** xx

**APPROVAL**

**Project Manager** (Print name & org/dept.) \_\_\_\_\_  
(Signature) \_\_\_\_\_ **Date** \_\_\_\_\_  
Note: Signature validates scope of work and that costs are agreed upon.

**PSUS** (Print name) \_\_\_\_\_  
(Signature) \_\_\_\_\_ **Date** \_\_\_\_\_  
Note: Signature validates scope of work and that costs are agreed upon.

**COR/Gov't POC** (Print name & org/dept.) \_\_\_\_\_  
(Signature) \_\_\_\_\_ **Date** \_\_\_\_\_  
Note: Signature verifies funds available to issue modification or task order.

**Date Customer Contacted PSUS:** xxx **Date of Site Visit:** xxx

**Date Estimate to Customer:** xxx **Modification/Task Order (TO):** xx

**Inspected by Govt** (Print name) \_\_\_\_\_  
(Signature) \_\_\_\_\_ **Date** \_\_\_\_\_  
Note: Signature verifies proper material used.


**Accepted by Govt** (Print name) \_\_\_\_\_  
(Signature) \_\_\_\_\_ **Date** \_\_\_\_\_  
Note: Signature verifies project completed to satisfaction. PSUS can be paid.

**PSUS Invoice Date:** \_\_\_\_\_

Building 2576 Essex Way, Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

## PSUS – Wet Utility SOPs (DRAFT)


**APPENDIX D**  
**TEMPORARY WATER SERVICE REQUEST**

	<b>Palmetto State</b> Utility Services, Inc. <small>A Subsidiary of American States Utility Services, Inc.</small>	<b>Temporary Water Service Request</b>
		PSUS Request # _____
<b>Business Name:</b> _____		
<b>Address:</b> _____		
<b>Office phone:</b> _____		
<b>Representative:</b> _____		
<b>Phone:</b> _____		
<b>Service Order Number:</b> _____		
<b>\$1,200 deposit provided:</b> ____ yes ____ no		
<b>\$300 service fee provided:</b> ____ yes ____ no		
<b>Rec'd By (PSUS Employee):</b> _____		
<b>Date that hydrant-bfp hook-up was provided:</b> _____		
<b>Initial Meter Reading:</b> _____		
<b>Meter serial #:</b> _____		
<b>Back Flow Preventer (bfp) serial #:</b> _____		
<b>Hydrant location:</b> _____		
<b>Expected date of project completion:</b> _____		
<b>Was hydrant permit renewed? (Attach all permits.)</b> ____ yes ____ no		
<b>Date that all equipment was returned:</b> _____		
<b>Return Meter Reading:</b> _____		
<b>PSUS representative authorizing acceptable condition of returned equip:</b>		
_____		
 Building 2576 Essayons Way, Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054		

## PSUS – Wet Utility SOPs (DRAFT)

## APPENDIX E

### WATER HYDRANT PERMIT



**Palmetto State**  
Utility Services, Inc.  
A Subsidiary of American States Utility Services, Inc.

## WATER HYDRANT PERMIT

### For Temporary Service

Applicant Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Billing Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone Number: \_\_\_\_\_ Fax Number: \_\_\_\_\_

Hydrant #: \_\_\_\_\_

**Note:** This permit terminates one year from issuing date. An additional \$300 check will be required to receive a Water Hydrant Permit renewal. At the time of payment PSUS will issue a new permit and install a currently certified hfp.

Your request for construction water use, for the above referenced hydrant number, is approved subject to the following conditions.

- 1) The Applicant agrees:
  - a. To take full responsibility for any repairs, damage, or theft of PSUS property.
  - b. That all repairs or replacements will be performed by PSUS and deducted from the \$1,200 deposit. Additional costs would be the responsibility of the contractor.
- 2) The Applicant may not use their own hfp or meter without express approval from PSUS; in the rare instances where such approval is given, it would necessitate that the Applicant provide documentation of certification on the hfp assembly being used. All other conditions remain.
- 3) Water may only be drawn from the issued fire hydrant.
- 4) The Applicant shall not operate the hydrant valve for any reason.
- 5) The Applicant must comply with all applicable PSUS and AWWA Water Specifications, including backflow prevention and cross connection standards.
- 6) The permitted hydrant shall remain accessible to the Fire Department at all times.

I certify that I have read and understood the above items and I agree to all conditions of this permit. The information I have provided on this permit is true and correct.

Applicant Signature: \_\_\_\_\_

PSUS Request # \_\_\_\_\_

Approved for Issuance by: \_\_\_\_\_ Date: \_\_\_\_\_

PSUS Employee Signature

Building 2576 ~~Essex~~ Way, Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2034

## PSUS – Wet Utility SOPs (DRAFT)

**APPENDIX F**  
TAPPING FEE SCHEDULE

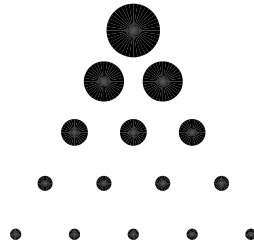
Tap Size	\$ Price for PSUS to perform construction	Price if tapping construction is done by others
2 x 2	839.00	350.00
4 x 2	1183.00	350.00
4 x 3	1849.00	350.00
4 x 4	1891.00	350.00
6 x 2	1117.00	350.00
6 x 3	2097.00	350.00
6 x 4	2321.00	350.00
6 x 6	2920.00	350.00
8 x 2	1165.00	350.00
8 x 3	2224.00	350.00
8 x 4	2387.00	350.00
8 x 6	3023.00	350.00
8 x 8	3404.00	350.00
10 x 2	1274.00	350.00
10 x 3	2369.00	350.00
10 x 4	2575.00	350.00
10 x 6	3259.00	350.00
10 x 8	3888.00	350.00
10 x 10	4196.00	350.00
12 x 2	1286.00	350.00
12 x 4	2599.00	350.00
12 x 6	3476.00	350.00
12 x 8	3864.00	350.00
12 x 10	4311.00	350.00
12 x 12	4765.00	350.00

**Note:** the above prices are to tap the main ONLY and do not reflect any other construction costs, such as roadway patching, etc. All fittings & hardware necessary to complete the tap are included.



# APPENDIX

## LL



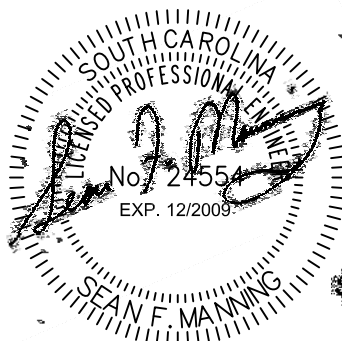
# PALMETTO STATE UTILITY SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

# CONSTRUCTION STANDARDS FORT JACKSON

Date: March 16, 2009

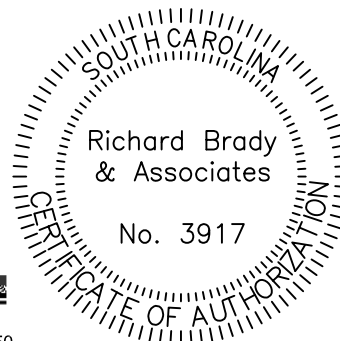
**EFFECTIVE June 16, 2009**

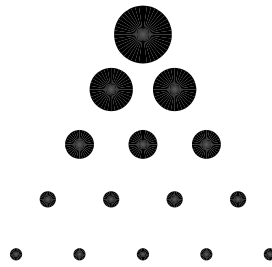


Prepared by



4824 Parkway Plaza Blvd. #250  
Charlotte, NC 28217





# PALMETTO STATE UTILITY SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

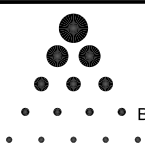
## CONSTRUCTION STANDARDS - FORT JACKSON

DWG. NO.	TITLE	DWG. NO.	TITLE
	GENERAL		WATER
G0	TABLE OF CONTENTS	W1	WATER NOTES
G1	STANDARD UTILITY SYMBOLS	W2	WATER NOTES
G2	STANDARD UTILITY SYMBOLS	W3	WATER NOTES
G3	STANDARD UTILITY SYMBOLS	W4	STANDARD WATER PIPE COVER
G4	TRENCHING DETAILS (NO PAVEMENT)	W5	1" WATER METER BOX (TRAFFIC)
G5	TRENCHING DETAILS (PAVEMENT)	W6	1" WATER METER COVER (TRAFFIC)
G6	TRENCHING TABLES	W7	1" WATER METER BOX (NON-TRAFFIC)
G7	PIPE SEPARATION DETAIL	W8	1" WATER METER COVER (NON-TRAFFIC)
G8	BOLLARD DETAIL	W9	VALVE BOX COVER
G9	THRUST BLOCK SIZING DETAIL	W10	VALVE BOX
G10	THRUST BLOCKING LOCATION DETAIL	W11	FIRE HYDRANT LOCATIONS
G11	CARRIER PIPE INSTALLATION W/CASING INSULATORS	W12	FIRE HYDRANT INSTALLATION
G12	GENERAL PAVEMENT REPAIR NOTE	W13	GATE VALVE DETAIL
G13	PERMANENT PAVEMENT PATCH	W14	CONCRETE BOXES W/BILCO HATCH
G14	ADJUSTABLE PIPE SUPPORT	W15	BLOWOFF ASSEMBLY
G15	CHAIN LINK FENCE & GATE	W16	2" AIR RELEASE VALVE
G16	STREAM CROSSING PIPE ENCASEMENT	W17	AIR RELEASE VALVE LOCATIONS
G17	STANDARD LOCATIONS FOR WATER & SEWER	W18	4" AUTO AIR RELEASE & AIR/VAC VALVE
	SEWER	W19	POST INDICATING VALVE
S1	SEWER NOTES	W20	2" PRESSURE RELIEF VALVE
S2	24" MANHOLE RING AND COVER	W21	TAPPING SADDLE AND VALVE
S3	48" SEWER MANHOLE	W22	24" MANHOLE RING AND COVER
S4	MANHOLE PENETRATION	W23	SAMPLING STATION
S5	SEWER SERVICE LATERAL	W24	3/4" OR 1" SERVICE
S6	STANDARD SEWER PIPE COVER	W25	2" SERVICE
S7	VCP SANITARY SEWER REPAIR	W26	CROSS CONNECTION CONTROL NOTES
S8	LIFT STATION SITE LAYOUT	W27	3" - 10" BACKFLOW PREVENTER W/OUT METER
S9	LIFT STATION PLAN	W28	3" - 10" BACKFLOW PREVENTER WITH METER
S10	LIFT STATION SECTION	W29	3" - 10" METER W/OUT BACKFLOW PREVENTER
S11	EMERGENCY CONNECTION	W30	ALL WEATHER ENCLOSURE
S12	SEWER GRINDER UNIT (SECTION A-A)	W31	ENCLOSURE ANCHOR
S13	SEWER GRINDER UNIT (SECTION B-B)	W32	45° MECHANICAL JOINT UTILITY INVERT
S14	ELECTRICAL RISER	W33	VALVE ANCHOR
S15	LIFT STATION NOTES	W34	STABILIZER UNIT
S16	SEWER POINT REPAIR	W35	RESTRAINT DETAIL (DUCTILE IRON PIPE)
S17	SEWER LATERAL ABANDONMENT	W36	WATER SERVICE ABANDONMENT
S18	OUTSIDE DROP MANHOLE		SPECIFICATIONS
			TECHNICAL PIPELINE INSTALLATION SPECS
			POTABLE WATER MATERIAL GUIDELINES

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

COVER



**PALMETTO STATE UTILITY SERVICES, INC.**

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	UPDATE TO REFLECT SHEET CHANGES	SFM	3-16-09	

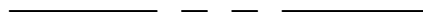
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NTS

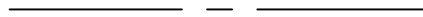
Friday, May 27, 2011

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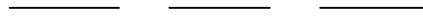
PROPERTY LINE AND RIGHT OF WAY LINE



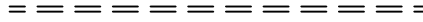
CENTER LINE



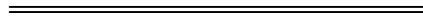
EASEMENT LINE



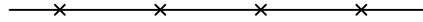
EXISTING CURB AND GUTTER



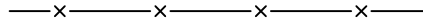
PROPOSED CURB AND GUTTER



CHAIN LINK FENCE



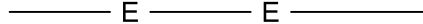
BARBED WIRE FENCE



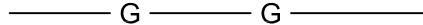
BURIED TELEPHONE



BURIED ELECTRICAL



BURIED GAS MAIN



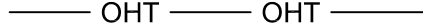
STORM DRAIN



TV CABLE



OVERHEAD TELEPHONE



OVERHEAD ELECTRIC



MATCH LINE



RAILROAD



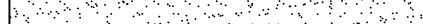
SLOPE



NATURAL GROUND



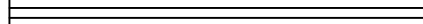
ROCK/GRAVEL



CONCRETE



HMAC



SOIL BORING LOCATION/BORING No.



B-1

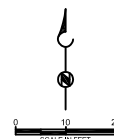
CATHODIC PROTECTION TEST STATION



BENCHMARK



NORTH ARROW AND SCALE  
(SET SCALE TO 2-INCHES  
@ FULL SIZE)



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

STANDARD UTILITY SYMBOLS

**PALMETTO STATE UTILITY  
SERVICES, INC.**

A Subsidiary of American States Utility Services, Inc.  
Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

## REVISIONS

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		ORIGINAL ISSUE DATE		6-11-08	
	1	NO CHANGES	SFM	3-16-09	

SCALE:

NTS

Friday, May 27, 2011

G1

WATER MAIN

WATER UNDER CONSTRUCTION

WELL FLOW LINES

WATER REUSE LINE

SEWER MAIN

SEWER UNDER CONSTRUCTION

EXISTING FORCE MAIN

LINE CROSSES ABOVE

LINE CROSSES BELOW

PROPOSED WATER MAIN

PROPOSED SEWER MAIN

PROPOSED FORCE MAIN

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: STANDARD UTILITY SYMBOLS

**PALMETTO STATE UTILITY SERVICES, INC.**  
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Building 2576, Essayons Way Fort Jackson, SC 29207  
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SCALE:

NTS

Friday, May 27, 2011

G2

GATE VALVE	
BUTTERFLY VALVE	
BALL VALVE (NORMALLY OPEN)	
BALL VALVE (NORMALLY CLOSED)	
CHECK VALVE	
PLUG VALVE (NORMALLY OPEN)	
PLUG VALVE (NORMALLY CLOSED)	
COUPLING	
REDUCER	
TEE	
CROSS	
BEND	
VERTICAL BEND	
PLUG FOR FUTURE CONNECTION	
WTR/SWR SERVICE CONNECTION	
CASING AND CARRIER PIPE	
EXISTING MANHOLE WITH FLOW ARROW	
PROPOSED MANHOLE WITH FLOW ARROW	
DROP MANHOLE	
MANHOLE STUB OUT	
FIRE HYDRANT	
FIRE HYDRANT	
METER BOX	

GENERAL NOTES:

1. SHEETING, SHORING, OR UNDERPINNING SHALL BE INSTALLED TO A MINIMUM DEPTH OF 5 FEET BELOW PIPE BEDDING OR AS REQUIRED TO STABILIZE ADJACENT STRUCTURES AND PIPELINES. THE ADEQUACY OF ALL SHEETING, SHORING AND UNDERPINNING IS THE RESPONSIBILITY OF THE CONTRACTOR. SHEETING AND SHORING SHALL BE REMOVED EXCEPT AS OTHERWISE SHOWN OR SPECIFIED.
2. TRENCH SAFETY SYSTEM / PLAN SHALL BE DESIGNED BY A SOUTH CAROLINA P.E.

KEY NOTES:

- 1 FOR BEDDING SEE TABLE A ON SHEET G6.
- 2 INITIAL BACKFILL SEE TABLE A ON SHEET G6.
- 3 SUBSEQUENT BACKFILL SEE TABLE A ON SHEET G6.

TYPICAL TRENCH LIMITATIONS:

D, IN.	W MIN, IN.	Bd MIN, IN.	Bt MIN, IN.
PIPE DIAM.	6	Bc+12	6

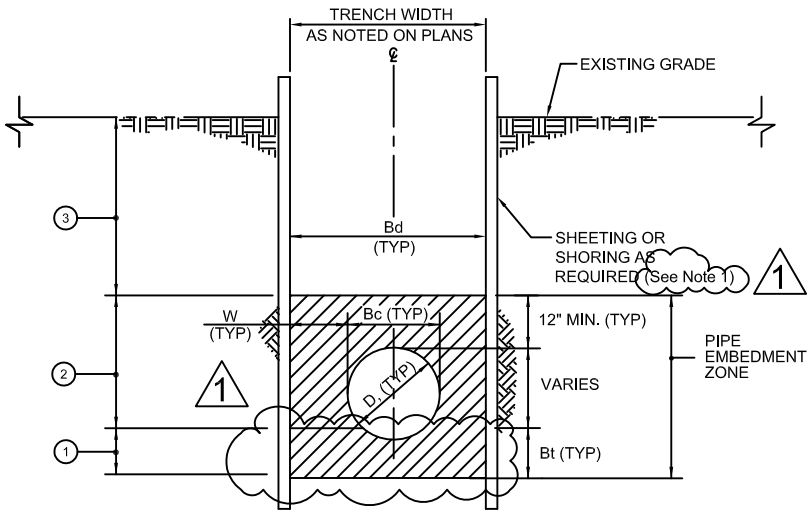
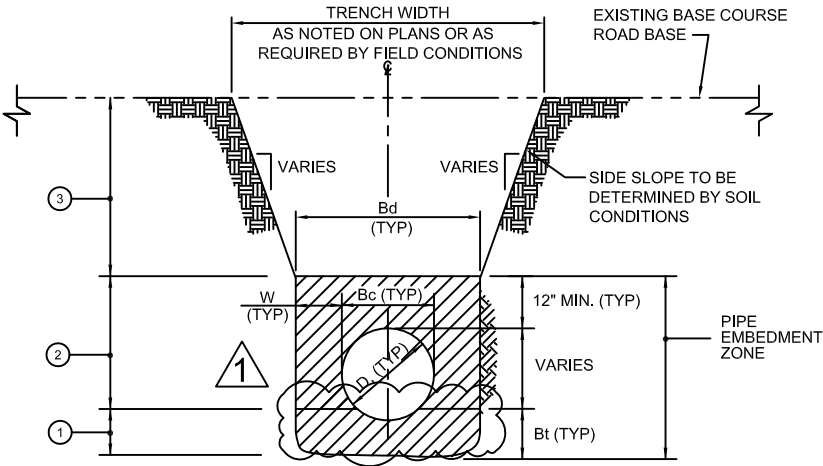
Bd = WIDTH FROM BOTTOM TO 12" ABOVE PIPE

W = CLEARANCE TO WALL, EXCLUDING SHEETING, I.E. TO EARTH

D = PIPE INSIDE DIAMETER, I.E. NOMINAL PIPE SIZE


Bc = PIPE OUTSIDE DIAMETER

Bt = DEPTH OF BEDDING FROM INVERT OF PIPE TO BOTTOM OF TRENCH



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: TRENCHING DETAILS (NO PAVEMENT)



PALMETTO STATE UTILITY SERVICES, INC.

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Building 2576, Essayons Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

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	1	REVISED BEDDING SPECIFICATION	SFM	3-16-09	

SCALE: NTS

DRAWING NUMBER

Friday, May 27, 2011

GENERAL NOTES:

1. NEW ASPHALT PAVEMENT SHALL MATCH EXISTING THICKNESS (2" MINIMUM).
2. CONTRACTOR SHALL REPLACE ENTIRE WIDTH OF PAVEMENT IF MORE THAN HALF OF THE EXISTING PAVED STREET IS DAMAGED.
3. BACKFILL WITH CLASS C BACKFILL MATERIAL PER INITIAL AND SUBSEQUENT BACKFILL KEY NOTES 2 AND 3.
4. REPLACE AND COMPACT THE 12 INCH BASE COURSE ROAD BASE TO 95% DENSITY.

KEY NOTES:

- 1 FOR BEDDING SEE TABLE A ON SHEET G6.
- 2 INITIAL BACKFILL SEE TABLE A ON SHEET G6.
- 3 SUBSEQUENT BACKFILL SEE TABLE A ON SHEET G6.

TYPICAL TRENCH LIMITATIONS:

D, IN.	W MIN, IN.	Bd MIN, IN.	Bt MIN, IN.
PIPE DIAM.	6	Bc+12	6

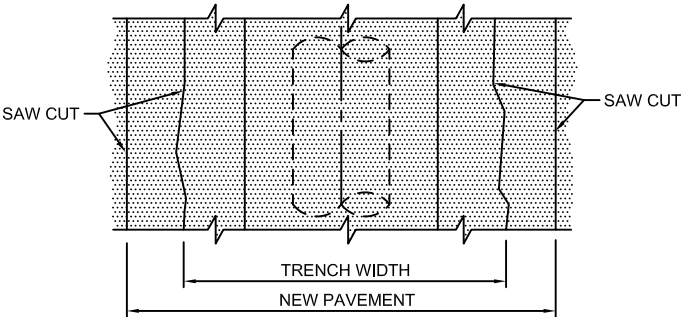
Bd = WIDTH FROM BOTTOM TO 12" ABOVE PIPE

W = CLEARANCE TO WALL, EXCLUDING SHEETING, I.E. TO EARTH

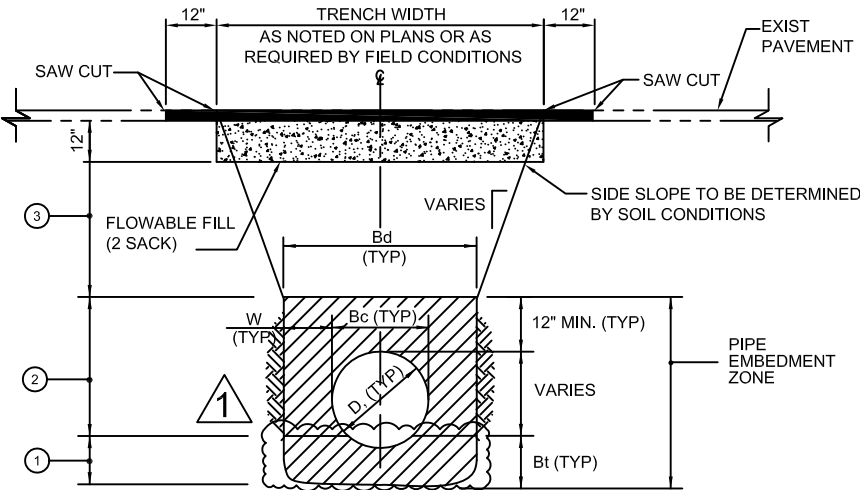
D = PIPE INSIDE DIAMETER, I.E. NOMINAL PIPE SIZE

Bc = PIPE OUTSIDE DIAMETER

Bt = DEPTH OF BEDDING FROM INVERT OF PIPE TO BOTTOM OF TRENCH



PLAN



SECTION

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: TRENCHING DETAILS (PAVEMENT)

 PALMETTO STATE UTILITY SERVICES, INC. A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054	REVISIONS						SCALE: <b>NTS</b> Friday, May 27, 2011 <b>G5</b>
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
			ORIGINAL ISSUE DATE		6-11-08		
		1	REVISED BEDDING SPECIFICATION	SFM	3-16-09		



## TRENCHING TABLES

## A. TABLE A, Fill Classifications

Material type	Maximum uncompressed layer depth, inches	Minimum relative compaction percent	General application
B	8	95	Structural (select) fill (per ASTM D-1557 modified proctor)
C	8	95	Subsequent pipeline backfill and backfill within 8 feet of structural foundations (per ASTM D-1557 modified proctor)
D	-	-	Structural granular base and slab on grade
F	12	95	Pipe bedding and initial backfill

## B. TYPE B:



Type B material shall be a select granular material free from organic matter and of such size and gradation that the specified compaction can be readily attained. Material shall have a sand equivalent value determined in accordance with ASTM D2419 of not less than 20 and shall conform to the following gradation:

U.S. standard sieve size	Percent by weight passing
3 inch	100
¾ inch	70-100
No. 4	40-100
No. 200	5-35

The coefficient of uniformity shall be 3 or greater. The plasticity index of the material, as determined in accordance with ASTM D 4318, shall not exceed 15 and the material shall have a liquid limit less than 40.

The material may be an imported quarry waste, clean natural sand or gravel, select trench excavation or a mixture thereof. The fill material shall be free from roots, grass, other vegetable matter, clay lump, rocks larger than 3 (three) inches in any dimension, or other deleterious materials.

## C. TYPE C:

Type C material shall be unclassified material which is free from peat, wood, roots, bark, debris, garbage, rubbish or other extraneous material. The maximum size of stone shall not exceed 2 inches. If the material excavated from the site meets these requirements, it may be classified as Type C and shall conform to the following gradation:

U.S. standard sieve size	Percent by weight passing
2 inch	100
No. 200	0 - 45

The plasticity index of the material, as determined in accordance with ASTM D 4318, shall not exceed 15.

## D. TYPE D:

Type D material shall be used for prepared subgrade under slabs and mat-type foundations where indicated on the drawings. Granular base shall meet the following grading requirements as determined in accordance with ASTM D 422:

U.S. standard sieve size	Percent by weight passing (by dry weight)
1 inch	100
¾ inch	85 - 100
No. 4	45 - 95
No. 200	0 - 8

The granular base should have a plasticity index of no greater than 12 when tested in accordance with ASTM D 4318. The coarse aggregate should have a percent of wear, when subjected to the Los Angeles abrasion test (ASTM C 131), of no greater than 50. Granular base should be compacted to at least 95 percent of maximum dry density in accordance with ASTM D 1557.

## F. TYPE F:

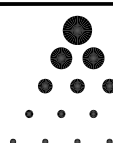
Type F material shall be Sand Equivalence (SE) of 30 or better.



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

TRENCHING TABLES



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G6

GENERAL NOTE:

1. SEPARATION DISTANCE SHALL COMPLY WITH STATE REGULATIONS.
2. ALL PIPES OTHER THAN SEWER MUST HAVE AT LEAST 12" OF SEPARATION.

CONSTRUCTION NOTES:

SEPARATION DISTANCE SHALL BE DETERMINED  
ACCORDING TO THE FOLLOWING CONDITIONS.

### CASE I. WATER MAIN PARALLEL TO SEWER MAIN

- a. LOCATION - WATER ABOVE SEWER  
b. SEWER MATERIALS - DI OR PVC.

**CASE II. SEWER MAIN PARALLEL WATER MAIN**

- a. LOCATION - WATER BELOW SEWER  
b. SEWER MATERIALS - DI.

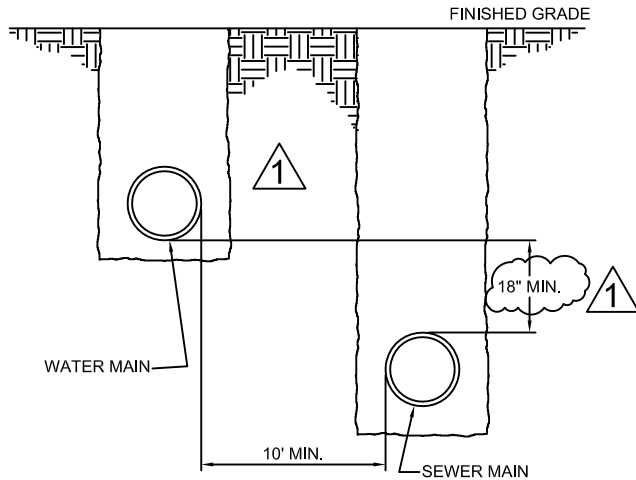
### CASE III. SEWER MAIN CROSSING WATER MAIN

- a. LOCATION - WATER BELOW SEWER  
b. SEWER MATERIALS - DI OR PVC, MIN  
PRESSURE RATING OF 150 PSI.

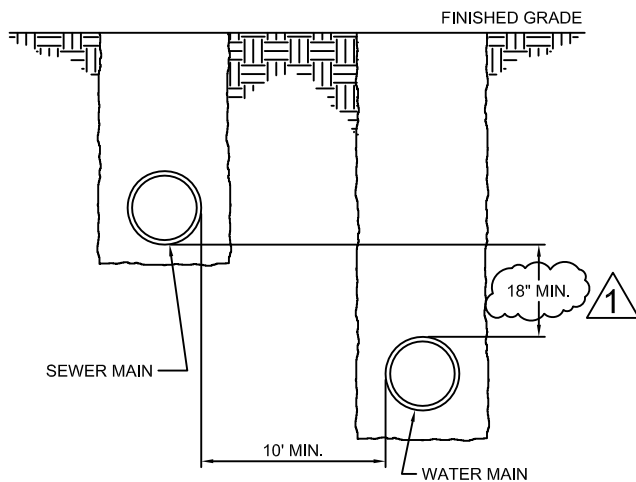
#### CASE IV. WATER MAIN CROSSING SEWER MAIN

- a. LOCATION - SEWER BELOW WATER  
b. SEWER MATERIALS - DI OR PVC, MINIMUM  
PRESSURE RATING OF 150 PSI, IF REPLACED.

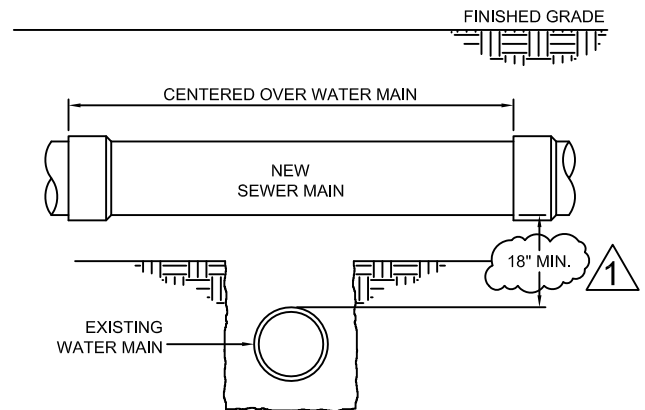
IF 10' HORIZONTAL SEPARATION FOR CASE I&II CANNOT BE ACHIEVED, THEN 4' HORIZONTAL SEPARATION WILL BE PERMITTED. SEWER MAIN WILL HAVE TO BE 150 PSI RATED UNTIL 10' SEPARATION IS ACHIEVED AGAIN.



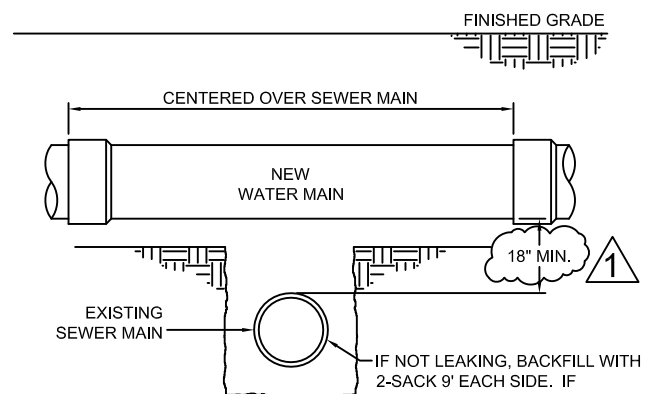
## CASE I



## CASE II



### CASE III



## CASE IV

— IF NOT LEAKING, BACKFILL WITH 2-SACK 9' EACH SIDE. IF LEAKING, REPLACE WITH 150 PSI RATED PIPE AND BACKFILL WITH 2-SACK 9' EACH SIDE.

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## PIPE SEPARATION DETAIL

PALMETTO STATE UTILITY  
SERVICES, INC.

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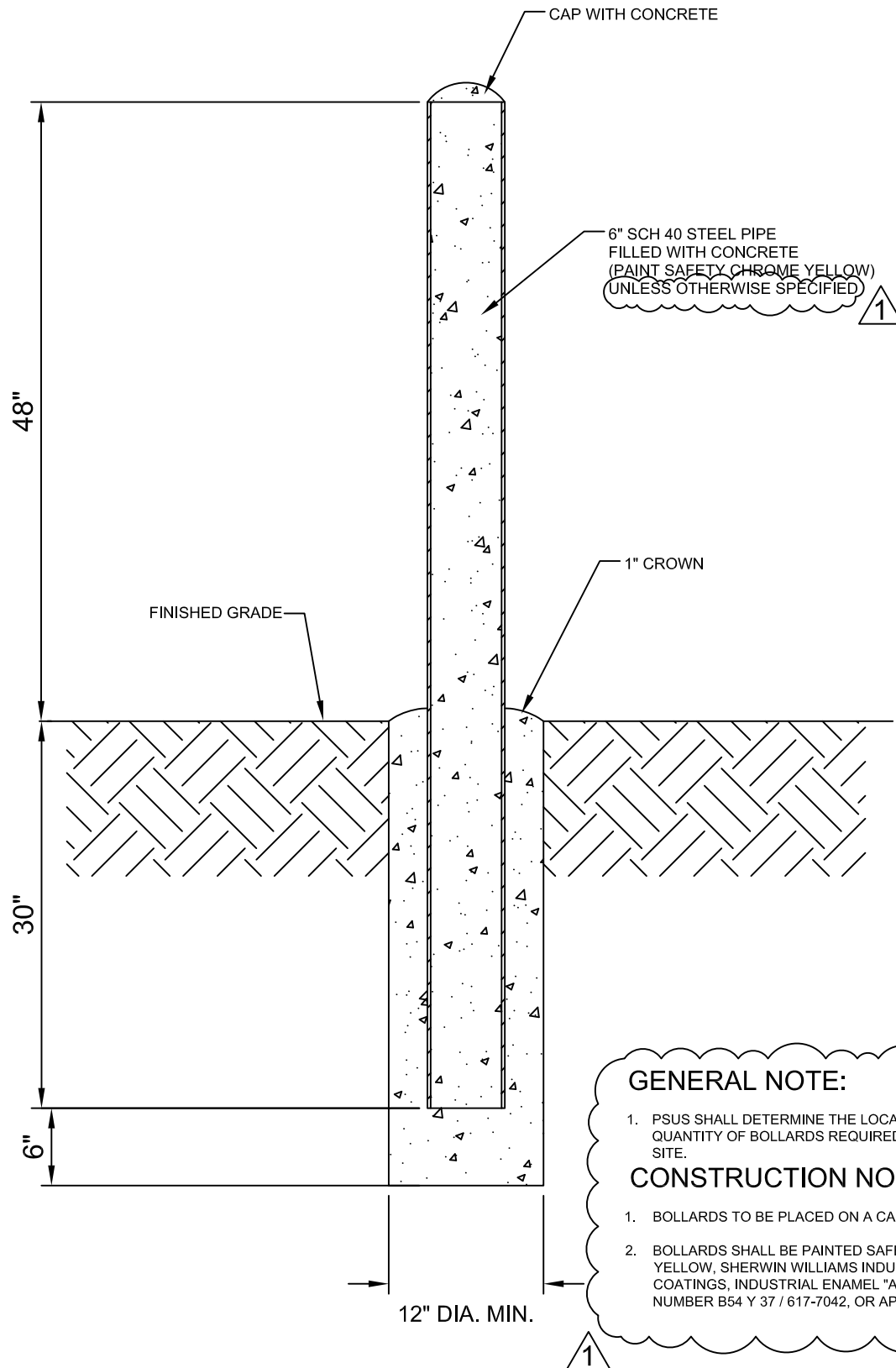
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ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REVISED DISTANCES AND MATERIALS	SFM	3-16-09	Er

SCALF.

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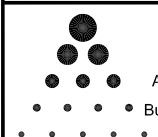
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# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

### PIPE BOLLARD DETAIL

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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REVISED BEDDING SPECIFICATION	SFM	3-16-09	Er

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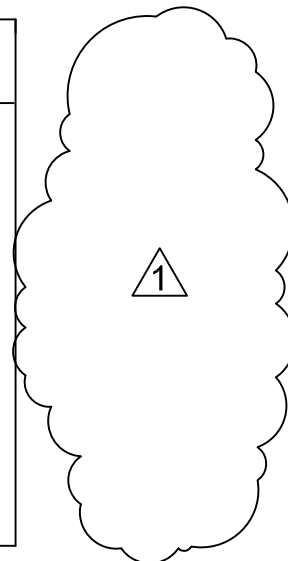
Friday, May 27, 2011

HORIZONTAL THRUST (LBS)  
MINIMUM BEARING AREA (SQUARE FEET)

FITTING SIZE	22 1/2 ° BEND		45 °BEND		90 °BEND		TEE OR DEAD END	
	THRUST	AREA	THRUST	AREA	THRUST	AREA	THRUST	AREA
4"	1,450	2	2,800	2	5,200	3	3,700	2
6"	2,900	2	5,800	3	10,700	6	7,600	4
8"	5,100	3	10,100	5	18,600	10	13,200	7
10"	8,300	5	16,500	8	30,400	16	21,500	12
12"	11,900	6	23,400	12	43,300	21	30,600	16
14"	16,100	8	31,800	16	58,700	30	41,500	21
16"	20,900	10	41,200	21	76,000	38	53,800	27

TYPICAL DIMENSIONS

BEARING AREA SQUARE, FEET	HORIZONTAL FEET	VERTICAL FEET	MIN DISTANCE FEET
2	2	1.5	1
3	2	1.5	1
4	2	2	1
5	2.5	2	1
6	3	2	1.25
7	3.5	2	1.5
8	4	2	1.7
10	5	2	2
16	5.3	3	2.25
21	6.4	3.3	2.75
27	7.2	3.75	3
30	7.5	4	3.5
38	9	4.5	3.5



NOTES:

- THRUST BLOCKS TO BE POURED AGAINST UNDISTURBED SOIL.
- MINIMUM VOLUME OF THRUST BLOCK IS 3 CUBIC FEET.
- THE ABOVE TABLES ARE BASED ON A SOIL HAVING A BEARING CAPACITY OF 2000 PSF. TO DETERMINE THE REQUIRED BEARING AREA FOR OTHER SOILS, MULTIPLY THE BEARING AREA BY THE FOLLOWING FACTORS.

MUCK	0 PSF	NOT ACCEPTABLE
SOFT CLAY	1000 PSF	MULTIPLY BEARING AREA BY 2.0
SAND	2000 PSF	NO ADJUSTMENT
SAND AND GRAVEL	3000 PSF	MULTIPLY BEARING AREA BY 0.66
CEMENTED SAND AND GRAVEL	4000 PSF	MULTIPLY BEARING AREA BY 0.5

- THE ABOVE TABLES ARE BASED ON A TEST PRESSURE OF 200 PSI. FOR OTHER PRESSURES ADJUST PROPORTIONATELY.

- PORTLAND CEMENT CONCRETE SHALL PROVIDE  $F'_c = 3,000$  PSI @ 28 DAYS.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

THRUST BLOCK SIZING DETAIL



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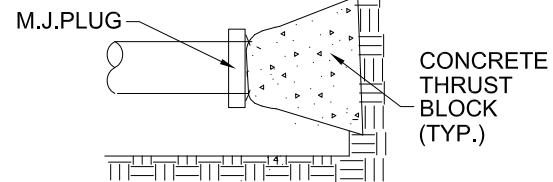
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REMOVED THRUST BLOCK DETAIL	SFM	3-16-09	

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G9



DEAD END



ALL BEARING  
SURFACES  
SHALL BE AGAINST  
UNDISTURBED  
GROUND (TYP.)



— CONCRETE  
SHALL BE KEPT  
CLEAR OF PIPE  
JOINTS(TYP.)

TITLE: THRUST BLOCK LOCATION DETAIL



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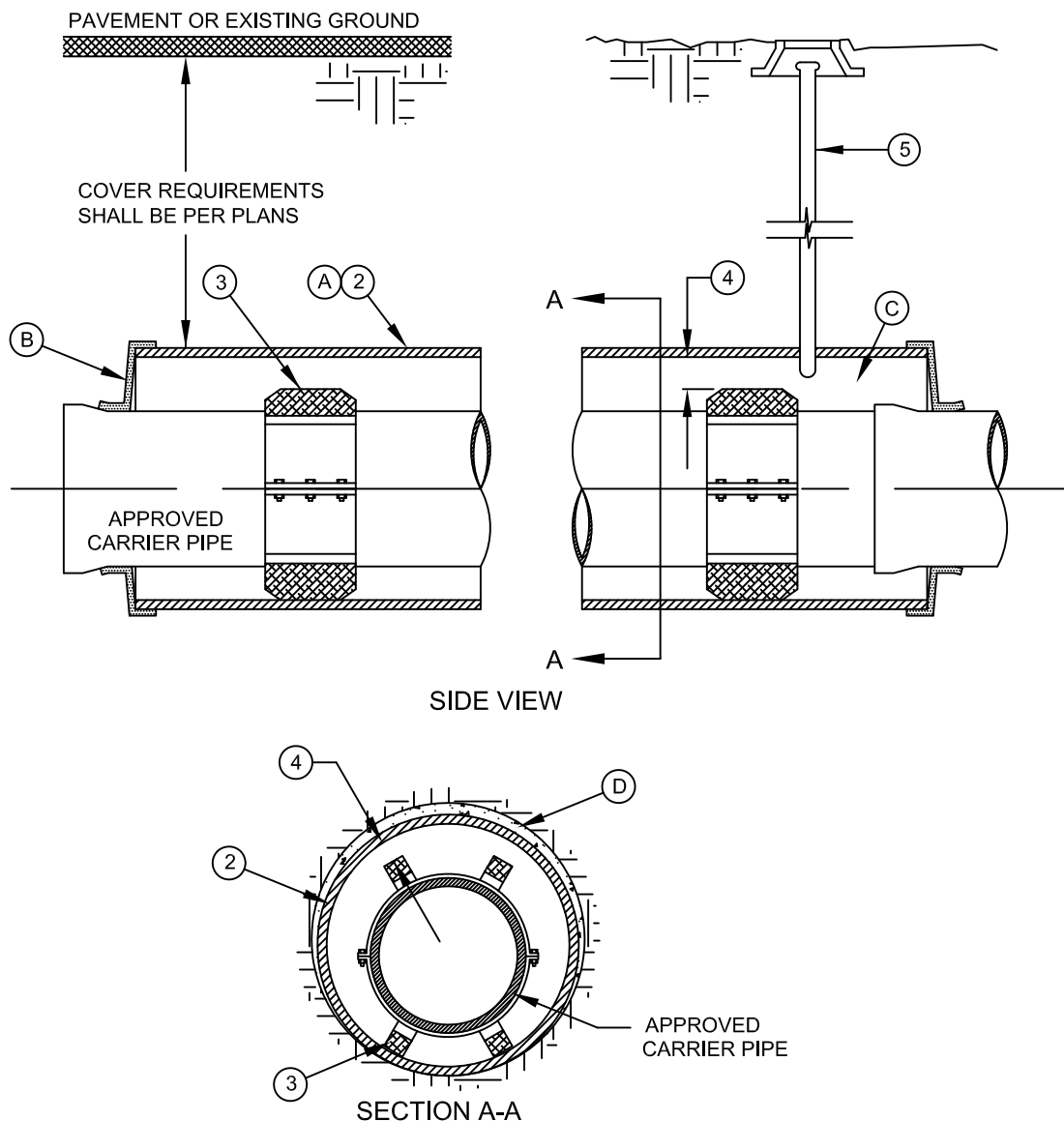
G10

CONSTRUCTION KEY NOTES:

- (A) CASING SHALL BE INSTALLED USING EITHER JACKING, BORING OR TUNNELING METHODS FROM THE END WHICH CREATES A MINIMUM OF ACCESS AND RELOCATION PROBLEMS.
- (B) END SHALL BE SEALED WITH BRICK AND MORTAR, BULKHEAD AND GROUT, OR WITH SYNTHETIC RUBBER SEAL, AS SPECIFIED.
- (C) ANNULAR SPACE SHALL BE LEFT OPEN FOR A CATHODICALLY PROTECTED SYSTEM WHERE BOTH CASING AND CARRIER PIPE ARE METALLIC MATERIAL, OR AS OTHERWISE SPECIFIED.
- (D) PRESSURE GROUT ANNULAR SPACE OUTSIDE CASING AFTER CASING IS INSTALLED.

KEY NOTES:

- ① INSULATED SPACERS SHALL BE USED WHEN SPECIFIED, TO PROVIDE CORROSION PROTECTION.
- ② STEEL CASING MINIMUM YIELD 36000 PSI, SIZE AND LENGTH AS SPECIFIED.
- ③ CASING INSULATORS, SPACING AND LOCATION PER ENGINEER'S REQUIREMENTS, INSULATORS SHALL FIT SNUG OVER THE CARRIER PIPE.
- ④ POSITION CARRIER PIPE APPROXIMATELY IN CENTER OF CASING. MINIMUM SPACING BETWEEN INSULATOR AND CARRIER PIPE SHALL BE 1", MAXIMUM SPACING SHALL BE 2".
- ⑤ PRECAUTIONARY OUTLET (6") WITH BONNET BOX AND COVER SHALL BE USED WHEN REQUIRED BY OTHER GOVERNING AGENCIES.



# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: CARRIER PIPE INSTALLATION W/ CASING INSULATORS



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Friday, May 27, 2011

1. MILLING EQUIPMENT USED IN LIEU OF SAW CUTTING AND PAVEMENT DISPOSAL SHALL BE APPROVED BY THE ENGINEER. PAVEMENT REMOVAL AND MILLING OPERATIONS ARE LIMITED TO 3000' PER SEWER MAIN CREW AND REQUIRE THE MILLINGS TO BE PLACED IN THE MILLED AREA AND COMPACTED TO ACT AS A TEMPORARY SURFACE FOR TRAFFIC. THE MILLINGS SURFACE ALONG AN UNDISTURBED TRENCH SHALL BE MAINTAINED AS DIRECTED BY THE ENGINEER. (NO SEPARATE PAYMENT)
2. CONTRACTOR SHALL SAW CUT OR MILL ALL PAVEMENTS STRAIGHT AND TRUE PRIOR TO TRENCHING. CONTRACTOR SHALL SAW CUT PATCH AREAS AGAIN IMMEDIATELY PRIOR TO PATCH PAVING. THE FINAL SAW CUT FOR PATCHES SHALL BE STRAIGHT WITH A NEAT SQUARE EDGE AND OF UNIFORM WIDTH PARALLEL WITH THE EDGE OF PAVEMENT/CURB LINE. NO JAGGED CUTS SHALL BE ACCEPTED. ADDITIONAL WIDTHS REQUIRED SHALL BE AT THE CONTRACTORS
3. SANITARY SEWER MAINS AND LATERALS SHALL BE PAID FOR BASED ON A 10' AND 6' WIDE PATCH RESPECTIVELY. WATER MAIN AND LATERAL PATCHES SHALL BE PAID FOR BASED ON A 4' WIDTH.
4. CONTRACTOR SHALL SWEEP STREETS AND PROVIDE DUST CONTROL AT ALL TIMES VIA WATER TRUCK, BROOMS, COMPACTORS, ETC. DEBRIS FROM SWEEPING OPERATIONS SHALL NOT BE DIRECTED TOWARD YARDS AND SHALL BE REMOVED AND DISPOSED OF. CLEAN UP OF DEBRIS, TRASH, EXCESS MATERIALS ETC. SHALL BE PERFORMED DAILY IN EACH PROJECT CONSTRUCTION AREA (NO SEPARATE PAYMENT).
5. THE DAY PRIOR TO PATCH PAVING OPERATIONS BEGIN THE CONTRACTOR MAY (A) REMOVE SOIL IN PATCH AREA TO SUB GRADE ON THE MAIN LINE TRENCH ON ANY CUL-DE-SAC'S LESS THAN 300 FEET IN LENGTH. (B) THE MAIN LINE TRENCH AND SEWER LATERALS ON THROUGH STREETS MAY BE CUT DOWN TO SUB GRADE ON ONE SIDE OF THE STREET ONLY.
6. THE MORNING THAT PAVING OPERATIONS BEGIN, THE CONTRACTOR MAY REMOVE THE REMAINING SOIL FROM THE MAIN LINE TRENCHES AND THE LATERALS TO SUB GRADE ON THE OTHER SIDE OF THE STREET. REMOVAL SHALL NOT EXCEED THE DAILY PATCH PAVING PRODUCTION.
7. ANY TRENCHES OPENED FOR PAVING SHALL BE PAVED BY THE END OF THE SAME DAY. IF WEATHER CONDITIONS CHANGE OR EQUIPMENT BREAKS DOWN, OR ANY OTHER OCCURRENCE THAT STOPS THE PAVING OPERATIONS OCCURS, ALL OPEN TRENCHES SHALL BE BACK FILLED BY THE END OF THE DAY WITH AGGREGATE BASE COURSE, AT THE CONTRACTOR'S EXPENSE.
8. THE CONTRACTOR SHALL PATCH PAVE SERVICE LATERALS ON THE SAME DAY THAT MAIN LINE TRENCHES ARE PAVED. LATERAL SHALL BE PATCHED ON BOTH SIDES OF THE STREET AS PAVING PROGRESSES.
9. THE CONTRACTOR SHALL BE REQUIRED TO IMPLEMENT PROPER TRAFFIC CONTROL PROVISIONS AND ANY DEVICES REQUIRED TO IDENTIFY OBSTRUCTIONS OR HAZARDS WITHIN THE RIGHT-OF-WAY TO INCLUDE REFLECTIVE CONES AT EACH SERVICE LATERAL REFLECTIVE BARRELS ON RAISED MANHOLES, ETC.
10. CONTRACTOR SHALL COMPLETE PATCH PAVING EACH 3000 LF INCREMENTAL SECTION PRIOR TO MOVING TO A NEW 3000 FOOT SECTION.
11. AT NO TIME SHALL THE CONTRACTOR LEAVE UNATTENDED AND/OR IMPROPERLY SECURE MAIN OR LATERAL TRENCHES WITH A VERTICAL ELEVATION DROP EXCEEDING 1" FROM EXISTING ASPHALT TO TRENCH SUB GRADE UNATTENDED OR OVERNIGHT.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

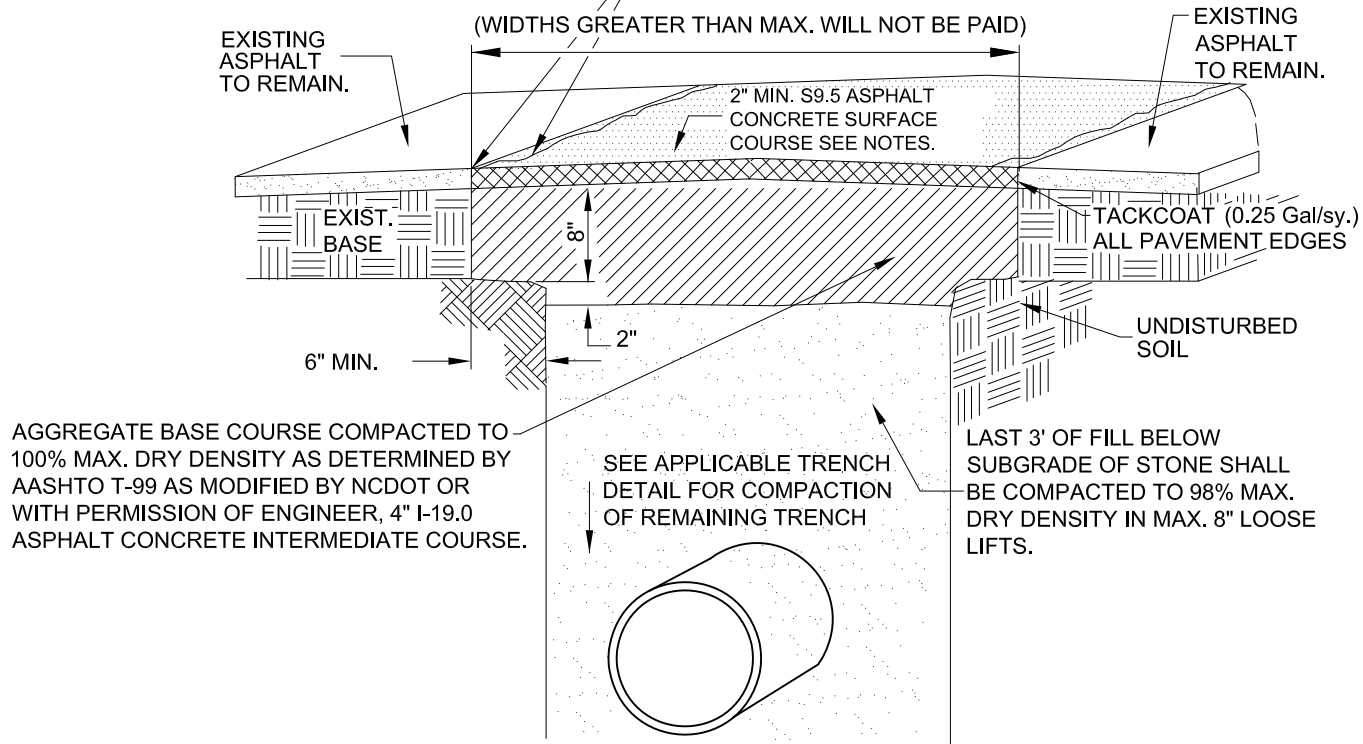
TITLE:

GENERAL PAVEMENT REPAIR NOTES

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			NEW SHEET	SFM	3-16-09		DRAWING NUMBER
							<b>G12</b>
						Friday, May 27, 2011	

Section Appendix 1  
 SAWCUT ASPHALT EDGES STRAIGHT AND TRUE APPROX. 2" DEEP IMMEDIATELY PRIOR TO PATCHING. JAGGED SAWCUTS SHALL NOT BE ACCEPTABLE. STRAIGHT UNIFORM WIDTHS PARALLEL TO THE EDGE OF PAV'T OR CURB ARE REQUIRED. THE FINAL PRODUCT SHALL BE SUBJECT TO THE ENGINEERS APPROVAL.

MAXIMUM "PAYMENT" WIDTH :  
 10' MAX. SANITARY SEWER MAIN (10' OR LESS)  
 12' MAX. SANITARY SEWER MAIN (OVER 10' IN DEPTH)  
 6' MAX. SANITARY SEWER LATERAL 4' MAX. WATER MAIN AND LATERAL



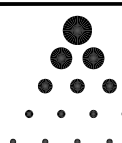
#### NOTES

- CONTRACTOR SHALL PATCH PAVEMENT TO THE SAME PAVEMENT CROSS SECTION AS EXISTED PRIOR TO REMOVING PAVEMENT. THE STREET CROWN SHALL BE RESTORED. ADJUST PAVER AS REQUIRED. PATCH PAVING MAY OCCUR PRIOR TO PULLING MANDREL THRU SS PROVIDED DENSITY TEST OF TRENCH BACKFILL MEET THE REQUIRED DENSITY AND ENGINEER APPROVES OF PATCHING STREET PRIOR TO MANDREL TESTING SANITARY SEWER MAIN.
- WHERE PATCH OF CURBING OCCURS CONTRACTOR SHALL MATCH EXISTING CURB GRADES WITHIN 0.02 FEET. PATCHES THAT ARE ABOVE THE CURB GRADE LINE WILL NOT BE ACCEPTABLE AND SHALL BE REMOVED AND REPATCHED AT NO EXPENSE TO ONUS. CURB PATCH SHALL BE THE SAME SHAPE/TEMPLATE AS THE EXISTING CURB.
- CONTRACTOR SHALL BE REQUIRED TO PROVIDE TRAFFIC CONTROL AND DEVICES AS REQUIRED BY FORT JACKSON. WORK CAN NOT PROCEED UNTIL THE MEASURES ARE IN PLACE. CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT NEW PAVEMENT FROM TRAFFIC AND OTHER SOURCES OF DAMAGE UNTIL ASPHALT HAS SUFFICIENTLY COOLED TO PREVENT DAMAGE FROM SURFACE DEFLECTIONS.
- CONTRACTOR SHALL SAWCUT EXIST. PAVEMENT STRAIGHT AND TRUE PRIOR TO REMOVING ASPHALT FOR UTILITY INSTALLATION. THE ENGINEER MAY APPROVE THE USE OF A MILLING MACHINE FOR REMOVAL OF THE EXISTING PAVEMENT WITHIN TRENCH LIMITS. WHERE MILLING IS APPROVED THE CONTRACTOR SHALL PLACE AND COMPACT MILLINGS IN MILLED AREA TO PROVIDE AN INTERIM TRAFFIC SURFACE. MILLING WHERE APPROVED BY ENGINEER IS AN ALTERNATE TO CUTTING ASPHALT AND DISPOSING OFF-SITE.
- AFTER UTILITY IS INSTALLED AND TESTED AND THE EXCESS BASE MATERIAL REMOVED (APPROX. 2") CONTRACTOR SHALL AGAIN SAWCUT EXISTING PAVEMENT STRAIGHT AND TRUE IMMEDIATELY PRIOR TO PAVING AS NOTED ABOVE.
- MILLING OPERATIONS SHALL BE LIMITED TO 1800 FEET PER MAIN LINE CREW NOT TO EXCEED 3000 FEET IN TOTAL OF DISTURBED ROADWAY FOR THE ENTIRE PROJECT AT ONE TIME. CONTRACTOR SHALL PATCH PAVE DISTURBED AREA OF ROADWAY PRIOR TO DISTURBING ADDITIONAL ROADWAY.
- AT NO TIME SHALL THE TRENCH BE LEFT UNATTENDED WITH A VERTICAL DROP GREATER THAN 1 INCH FROM ASPHALT SURFACE TO TOP OF BACKFILLED TRENCH.
- IF PAVEMENT SETTLEMENT OCCURS WITHIN 1 YEAR, THE CONTRACTOR SHALL REPATCH AT NO ADDITIONAL EXPENSE TO PSUS.
- FULL DEPTH ASPHALT PATCH TO MATCH EXISTING ASPHALT THICKNESS ON STATE MAINTAINED ROADS WILL BE REQUIRED. SCDOT REQUIRES PATCH PAVING SAME DAY AS REMOVAL.
- TEST FOR DENSITY OF COMPACTION MAY BE MADE AT THE OPTION OF THE ENGINEER AND DEFICIENCIES SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST TO PSUS. THE ENGINEER MAY HAVE COMPACTION TEST PERFORMED AFTER THE BACKFILL IS COMPLETE. CONTRACTOR SHALL BE REQUIRED TO EXCAVATE TO VARIOUS ELEVATIONS FOR DENSITY TESTING EXCAVATION, BACKFILL AND RECOMPACTION SHALL BE PERFORMED AT NO ADDITIONAL COSTS TO PSUS.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

PERMANENT PAVEMENT PATCH



**PALMETTO STATE UTILITY SERVICES, INC.**

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
 Tel: (803) 790-7288 Fax: (803) 787-2054

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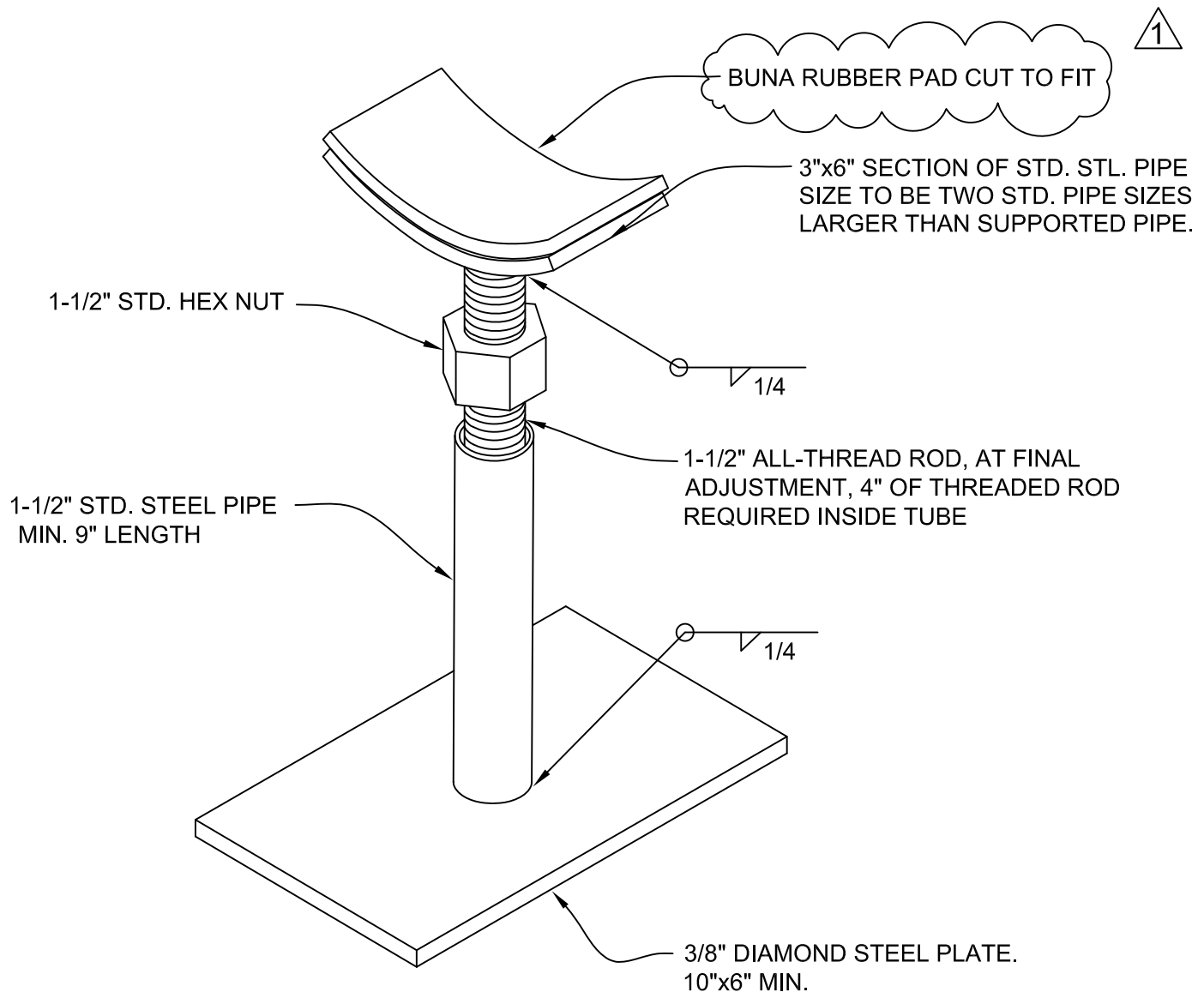
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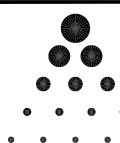
### GENERAL NOTES:

1. PIPE SUPPORTS SHALL BE PAINTED AND COATED IN ACCORDANCE WITH THE STANDARD PAINT SPECIFICATIONS. COLOR DESERT SAND (TAN).
2. ALL THREADED AREAS SHALL BE COATED WITH "NEVER-SEIZE" OR OTHER EQUIVALENT ANTI-RUST LUBRICANT.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

ADJUSTABLE PIPE SUPPORT



**PALMETTO STATE UTILITY  
SERVICES, INC.**

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

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	1	ADD BUNA RUBBER PAD	SFM	3-16-09	

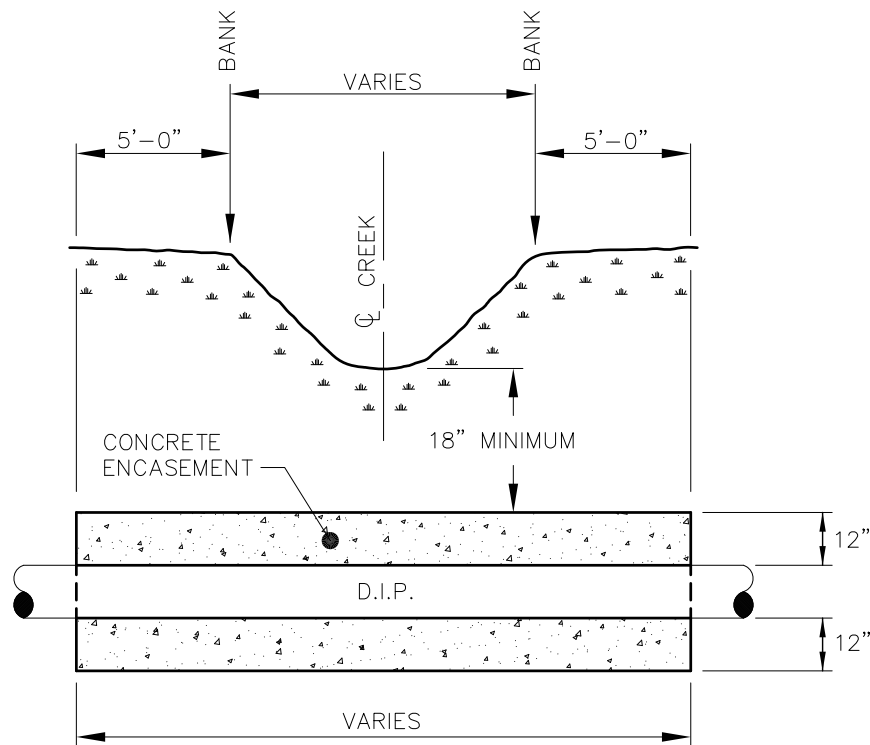
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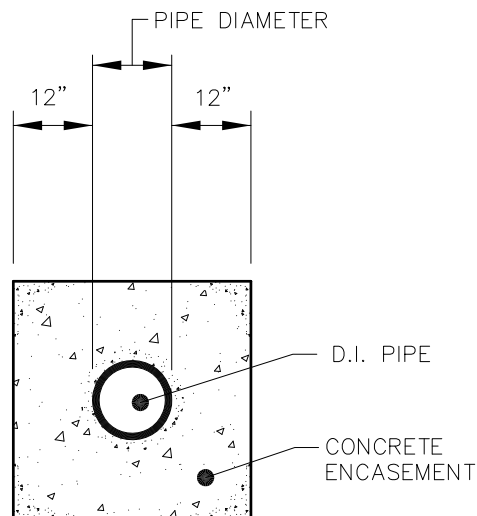
Friday, May 27, 2011

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STANDARD CONSTRUCTION DRAWING - FORT JACKSON					TITLE: CHAIN LINK FENCE & GATE					
<div><p><b>PALMETTO STATE UTILITY SERVICES, INC.</b> A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054</p></div>			REVISIONS						SCALE:	
			ZONE	REV.	DESCRIPTION	BY	DATE	APP.	<div>NTS Friday, May 27, 2011 G15</div>	
					NEW SHEET		3-16-09			



CROSS SECTION



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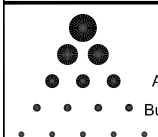
NOTES:

1. CONCRETE SHALL BE 3,000 P.S.I.
2. CONCRETE ENCASEMENT NOT REQUIRED WHEN PIPE IS AT LEAST THREE (3) FEET UNDER CENTERLINE OF CREEK BOTTOM.

## STANDARD CONCRETE ENCASEMENT FOR STREAM CROSSING

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: STREAM CROSSING PIPE ENCASEMENT



**PALMETTO STATE UTILITY  
SERVICES, INC.**  
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Building 2576, Essayons Way Fort Jackson, SC 29207  
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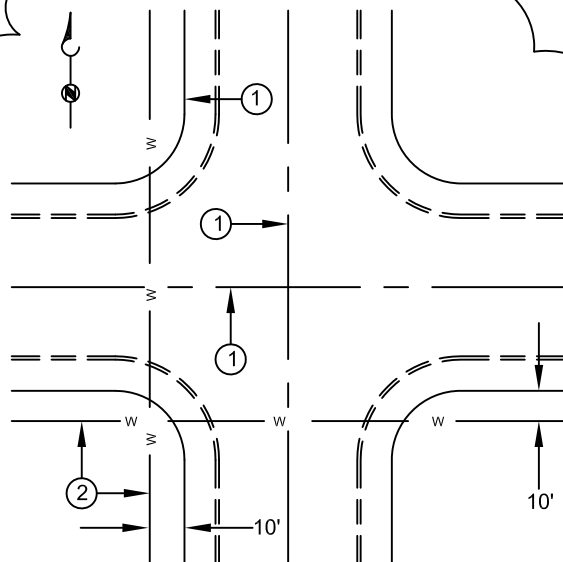
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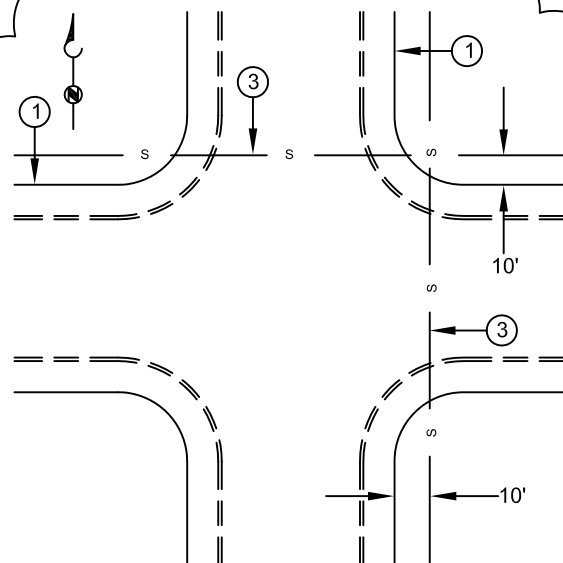
Friday, May 27, 2011

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- ① REFERENCE LINE SHALL BE EDGE OF PAVEMENT OR TOP FRONT FACE OF GUTTER.
- ② WATER EXTENSIONS SHALL BE LOCATED ON HIGHER ELEVATIONS SIDE OF STREETS OR ALLEYS.
- ③ SEWER EXTENTIONS SHALL BE LOCATED ON LOWER ELEVATION SIDE OF STREETS OR ALLEYS.



## WATER LOCATIONS



## SANITARY SEWER LOCATIONS

TITLE: STANDARD LOCATIONS FOR WATER & SEWER LINES



Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

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DRAWING NUMBER

Friday, May 27, 2011

THIS SHOULD BE USED AS A GENERAL GUIDE. SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL (SCDHEC) REGULATIONS R.61-67 SHALL BE USED FOR SPECIFIC DESIGN CRITERIA.  
THE INFORMATION REQUIRED BY R.61-67 INCLUDES THE APPROPRIATE SECTION FOR REFERENCE.

A. GENERAL REQUIREMENTS:

1. CONSTRUCTION SPECIFICATIONS MUST BE SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER. THE SPECIFICATIONS SHOULD INCLUDE THE ENGINEERING FIRM'S CORPORATE SEAL ALONG WITH THE SEAL AND SIGNATURE OF ALL ENGINEERS OF THE FIRM UTILIZING THESE SPECIFICATIONS. (67.100.E.2)
2. ALL STANDARDS CITED IN THE TEXT REFER TO THE LATEST REVISION OF THAT STANDARD UNDER THE SAME SPECIFICATION NUMBER OR TO SUPERSEDING SPECIFICATIONS UNDER A NEW NUMBER.

B. MATERIALS REQUIREMENTS:

1. GRAVITY SEWER LINE MATERIALS SHALL CONFORM TO THE FOLLOWING, AT A MINIMUM: (67.300.A.17)
  - a. PVC PIPE; INSTALLATION: ASTM D-3033, D-3034 OR F-789-82; ASTM D-2321.
  - b. DIP: ASTM A-746 OR ANSI A21.50 & ANSI 21.51 OR AWWA C150 & AWWA C151.
  - c. CIP AND JOINTS: ANSI A21.1, A21.6, A21.8, A21.10, AND/OR A21.11.
2. FORCE MAIN MATERIALS SHALL CONFORM TO THE FOLLOWING, AT A MINIMUM: (67.300.A.17)
  - a. PVC FORCE MAIN; INSTALLATION: ASTM D-2241; ASTM D-2321 OR ASTM D-2774.
  - b. CIP AND DIP FORCE MAIN; INSTALLATION: ASTM A-377; AWWA C-600.
3. PRECAST CONCRETE MANHOLES SHALL CONFORM TO ASTM C-478, AT A MINIMUM.

C. INSTALLATION REQUIREMENTS:

3. ALL SEWERS SHALL BE CONSTRUCTED WITH A MINIMUM DEPTH OF THREE (3) FEET OF COVER, UNLESS JUSTIFIED BY THE APPLICANT AND APPROVED BY THE DEPARTMENT (E.G., USE OF DUCTILE IRON PIPE MAY HAVE COVER LESS THAN THREE (3) FEET). (67.300.A.12)
2. SEPARATION OF SEWERS AND WATER MAINS: (67.300.A.14.(A)-(F))
  - a. POTABLE WATER SUPPLY INTERCONNECTIONS. THERE SHALL BE NO PHYSICAL CONNECTIONS BETWEEN A PUBLIC OR PRIVATE POTABLE WATER SUPPLY SYSTEM AND A SEWER, OR APPURTENANCE THERETO WHICH MAY PERMIT THE PASSAGE OF ANY SEWAGE OR POLLUTED WATER INTO THE POTABLE SUPPLY. NO POTABLE WATER PIPE SHALL PASS THROUGH OR COME INTO CONTACT WITH ANY PART OF A SEWER MANHOLE.
  - b. HORIZONTAL AND VERTICAL SEPARATION FROM POTABLE WATER MAINS. SEWERS SHALL BE LAID AT LEAST 10 FEET HORIZONTALLY FROM ANY EXISTING OR PROPOSED POTABLE WATER MAIN. THE DISTANCE SHALL BE MEASURED EDGE TO EDGE. IN CASES WHERE IT IS NOT PRACTICAL TO MAINTAIN A 10 FOOT SEPARATION, THE DEPARTMENT MAY ALLOW DEVIATION ON A CASE-BY-CASE BASIS, IF SUPPORTED BY DATA FROM THE DESIGN ENGINEER. SUCH DEVIATION MAY ALLOW INSTALLATION OF THE SEWER CLOSER TO A POTABLE WATER MAIN, PROVIDED THAT THE POTABLE WATER MAIN IS IN A SEPARATE TRENCH OR ON AN UNDISTURBED EARTH SHELF LOCATED ON ONE SIDE OF THE SEWER AND AT AN ELEVATION SO THE BOTTOM OF THE POTABLE WATER MAIN IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.
  - c. CROSSINGS. SEWERS CROSSING POTABLE WATER MAINS SHALL BE LAID TO PROVIDE A MINIMUM VERTICAL SEPARATION OF 18 INCHES BETWEEN THE OUTSIDE OF THE POTABLE WATER MAIN AND THE OUTSIDE OF THE SEWER. THIS SHALL BE THE CASE WHERE THE POTABLE WATER MAIN IS EITHER ABOVE OR BELOW THE SEWER. WHENEVER POSSIBLE, THE POTABLE WATER MAIN SHALL BE LOCATED ABOVE THE SEWER MAIN. WHERE A NEW SEWER LINE CROSSES A NEW POTABLE WATER MAIN, A FULL LENGTH OF PIPE SHALL BE USED FOR BOTH THE SEWER LINE AND POTABLE WATER MAIN AND THE CROSSING SHALL BE ARRANGED SO THAT THE JOINTS OF EACH LINE SHALL BE AS FAR AS POSSIBLE FROM THE POINT OF CROSSING AND EACH OTHER. WHERE A POTABLE WATER MAIN CROSSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT SHALL BE PROVIDED FOR THE SEWER LINE TO PREVENT DAMAGE TO THE POTABLE WATER MAIN WHILE MAINTAINING LINE AND GRADE.
  - d. FORCE MAINS. THERE SHALL BE AT LEAST A 10 FOOT HORIZONTAL SEPARATION BETWEEN SANITARY SEWER FORCE MAINS AND POTABLE WATER MAINS. THERE SHALL BE AN 18 INCH VERTICAL SEPARATION AT CROSSING AS REQUIRED IN SUBSECTION 67.300.A.14.B AND SUBSECTION 67.300.A.14.C.
  - e. SPECIAL CONDITIONS. WHEN IT IS IMPOSSIBLE TO OBTAIN THE DISTANCES SPECIFIED IN SUBSECTION 67.300.A.14.B, SUBSECTION 67.300.A.14.C, AND SUBSECTION 67.300.A.14.D THE DEPARTMENT MAY ALLOW AN ALTERNATIVE DESIGN. ANY ALTERNATIVE DESIGN SHALL:
    - i. MAXIMIZE THE DISTANCES BETWEEN THE SEWER LINE AND THE POTABLE WATER MAIN AND THE JOINTS OF EACH;
    - ii. USE PIPE MATERIALS WHICH MEET THE REQUIREMENTS AS SPECIFIED IN REGULATION 61-58.4(D)(1) FOR THE SEWER LINE; AND
    - iii. ALLOW ENOUGH DISTANCE TO MAKE REPAIRS TO ONE OF THE LINES WITHOUT DAMAGING THE OTHER.
  - f. SEWER MANHOLES. NO POTABLE WATER PIPE SHALL PASS THROUGH OR COME INTO CONTACT WITH ANY PART OF A SEWER MANHOLE.
3. MANHOLE TOP ELEVATIONS SHALL BE GREATER THAN OR EQUAL TO THE FIFTY (50) YEAR FLOOD ELEVATION, UNLESS WATERTIGHT COVERS ARE PROVIDED. (67.300.B.7)
4. DROP MANHOLES ARE REQUIRED WHERE THE INVERT DIFFERENTIAL IS 24 INCHES OR MORE. (67.300.B.8)
5. EACH SECTION OF SEWER PIPE SHALL BE SPECIFIED TO BE LAID TO THE APPROPRIATE LINE AND GRADE, AS DESIGNED, WORKING IN THE UPSTREAM DIRECTION WITH THE BELL END LAID UPGRADE. (67.300.B.11)
6. ALL GRAVITY SEWERS SHALL BE DESIGNED AND SPECIFIED SUCH THAT THE LEAKAGE OUTWARD (EXFILTRATION) OR INWARD (INFILTRATION) SHALL NOT EXCEED TWO HUNDRED (200) GALLONS PER INCH OF PIPE DIAMETER PER MILE PER DAY. AN AIR TEST MAY BE UTILIZED IN LIEU OF AN INFILTRATION/EXFILTRATION TEST, IF APPROVED BY THE DEPARTMENT. AIR TESTING SHALL CONFORM TO ASTM F-1417 (PLASTIC PIPE). (67.300.B.12)
7. FOR FORCE MAINS, THRUST BLOCKING OR RESTRAINT JOINTS SHALL BE PROVIDED AT ALL CHANGES IN ALIGNMENT GREATER THAN OR EQUAL TO 30 DEGREES. (67.300.D.3)
8. AN AUTOMATIC AIR RELIEF VALVES SHALL BE PLACED AT HIGH POINTS IN THE FORCE MAIN SEWER TO PREVENT AIR LOCKING. (67.300.D.4)
9. DESIGN AND CONSTRUCTION OF FORCE MAINS SHALL BE SUCH THAT THEY SATISFY A LEAKAGE TEST IN ACCORDANCE WITH AWWA C-600 (DIP) OR AWWA C-605 (PVC). (67.300.D.6)

D. CONSTRUCTION DETAILS:

1. TYPICAL MANHOLE, DROP MANHOLE DETAILS AND FORCE MAIN TIE-IN DETAILS, SHOWING HORIZONTAL AND VERTICAL CROSS SECTIONS SHALL INCLUDE THE FOLLOWING:
- a. MANHOLES SHALL HAVE A MINIMUM INSIDE DIAMETER OF 4 FEET AND 5 FEET WITH AN INSIDE DROP PIPE. THE MINIMUM MANHOLE ACCESS DIAMETER SHALL BE 22 INCHES. (67.300.B.9)
- b. FORCE MAINS TYING ONTO MANHOLES SHALL ENTER THE MANHOLE A VERTICAL DISTANCE OF NOT MORE THAN 2 FEET ABOVE THE FLOW LINE OF THE RECEIVING MANHOLE. (67.300.D.5)

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

SEWER NOTES



PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
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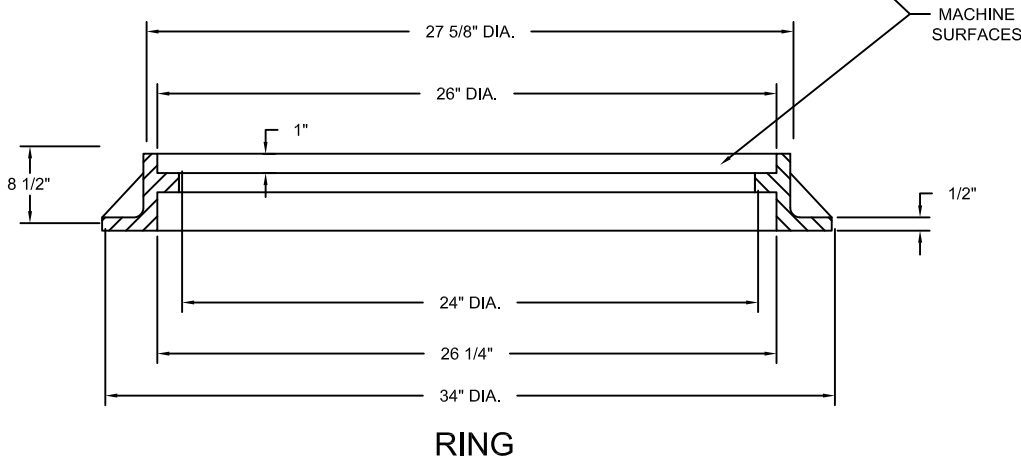
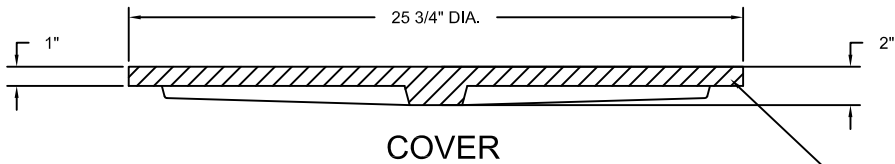
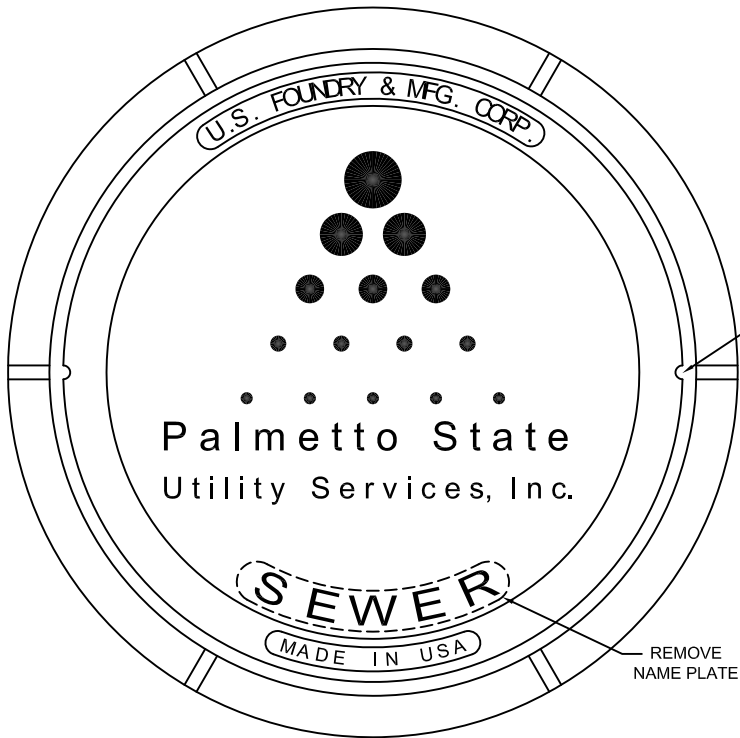
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
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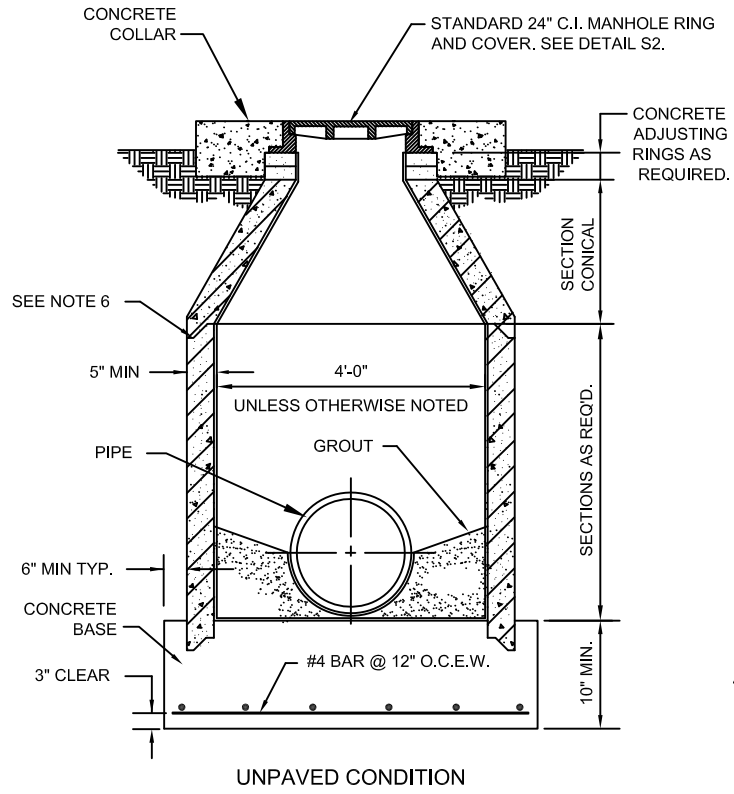
- 1. MATCHING SURFACES MARKED "MF" TO BE FINISHED OF ANY IRREGULARITIES THAT WOULD PREVENT A SNUG FIT.
- 2. CASTING TO BE SMOOTH AND VOID OF AIR HOLES.
- 3. PRODUCT SHALL BE U.S. FOUNDRY & MFG. CORP. ORDERED AS FOLLOWS:

MATERIAL:     ASTM - A48  
GRAY IRON CLASS: 35B  
RING WEIGHT:    260 LBS.  
COVER WEIGHT:   140 LBS  
ITEM NO.:       8014845

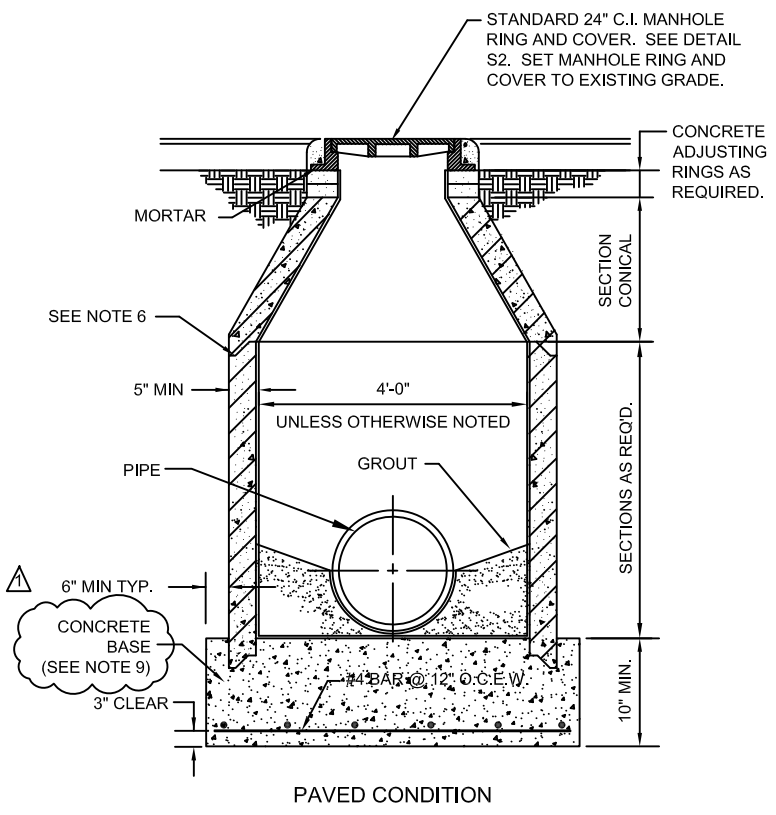
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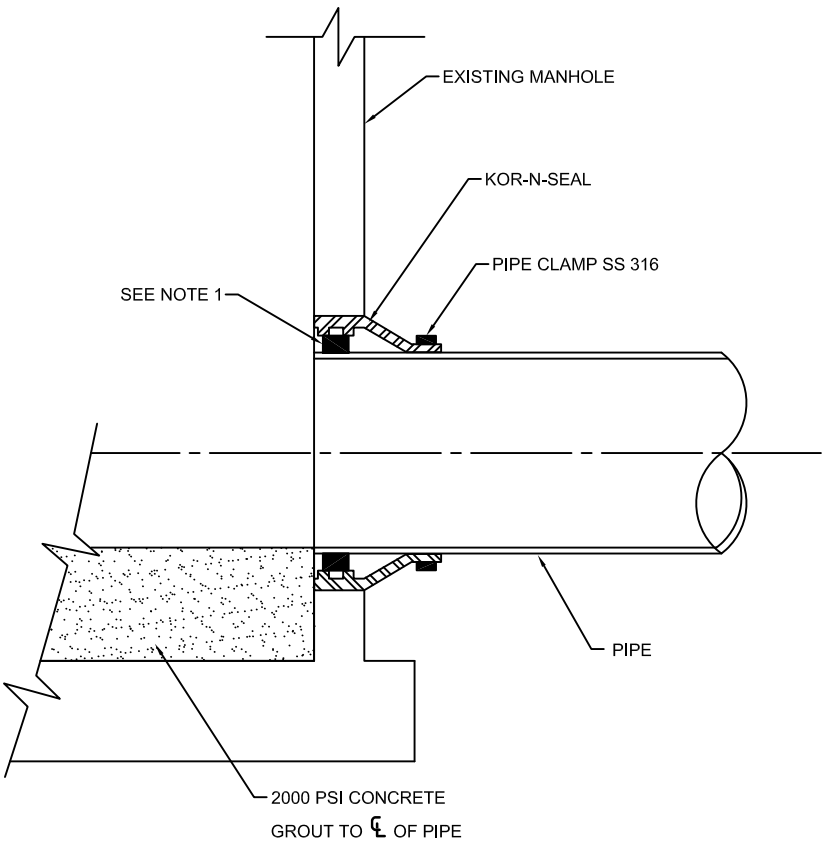


STANDARD CONSTRUCTION DRAWING - FORT JACKSON				TITLE: 24" MANHOLE RING AND COVER			
 PALMETTO STATE UTILITY SERVICES, INC. A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054	REVISIONS						SCALE: <b>NTS</b> DRAWING NUMBER <b>S2</b> Friday, May 27, 2011
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
			ORIGINAL ISSUE DATE		6-11-08		
		1	ADD RING AND COVER INFORMATION	SFM	3-16-09		



- GENERAL NOTES:**
1. THE PRE-CAST MANHOLE RISER AND CONICAL SECTIONS SHALL BE REINFORCED CONCRETE AND SHALL CONFORM TO ASTM SPECIFICATION C-478.
  2. THE CONICAL SECTIONS CAN BE CONCENTRIC AND SHALL BE ADAPTED TO THE RING AT ONE END AND PSUS STANDARD CAST IRON FRAME AT THE OTHER.
  3. THE PRE-CAST CONCRETE SHALL HAVE A MINIMUM ALLOWABLE COMPRESSIVE STRENGTH AT 28 DAYS OF 4000 POUNDS/SQ. INCH FOR THE RISER SECTIONS AND FOR THE CONICAL SECTIONS.
  4. THE RISER SECTIONS SHALL BE REINFORCED WITH STEEL WIRE MESH 6x6x10x10 AND THE CONICAL SECTION SHALL HAVE 6x6x10x10 STEEL WIRE MESH REINFORCEMENT AND 3/8 ROD AT TOP AND BOTTOM. (SEE ASTM STANDARDS PART 16-C-478).
  5. THE BASE SHALL BE CLASS B CONCRETE POURED ON UNDISTURBED OR SUB-BASE, COMPACTED TO 95% ASTM D1557.
  6. ALL JOINTS, SHALL BE TONGUE AND GROOVE WITH PREFORMED FLEXIBLE BUTYL RUBBER MASTIC SEALANT. SEALANT SHALL CONFORM TO AASHTO M-198 AND FEDERAL SPECIFICATION SS-S-210A.
  7. FOR PIPE CONNECTION SEE DETAIL S4.
  8. THE INTERIOR OF THE MANHOLE SHALL BE LINED WITH A TWO STEP POLYURETHANE PROTECTIVE COATING.  
STEP ONE WILL BE ONE OF THE FOLLOWING PRIMER:
    - TNE MEC SERIES 201 EPOXOPRIME.
    - RAVEN 110 PRIMER.STEP TWO WILL BE ONE OF THE FOLLOWING TOPCOAT LINER:
    - TNE MEC SERIES 436 PERMA-SHIELD FR.
    - RAVEN 404.
  9. ENGINEERED PRE-CAST BASE SHALL BE ALLOWED

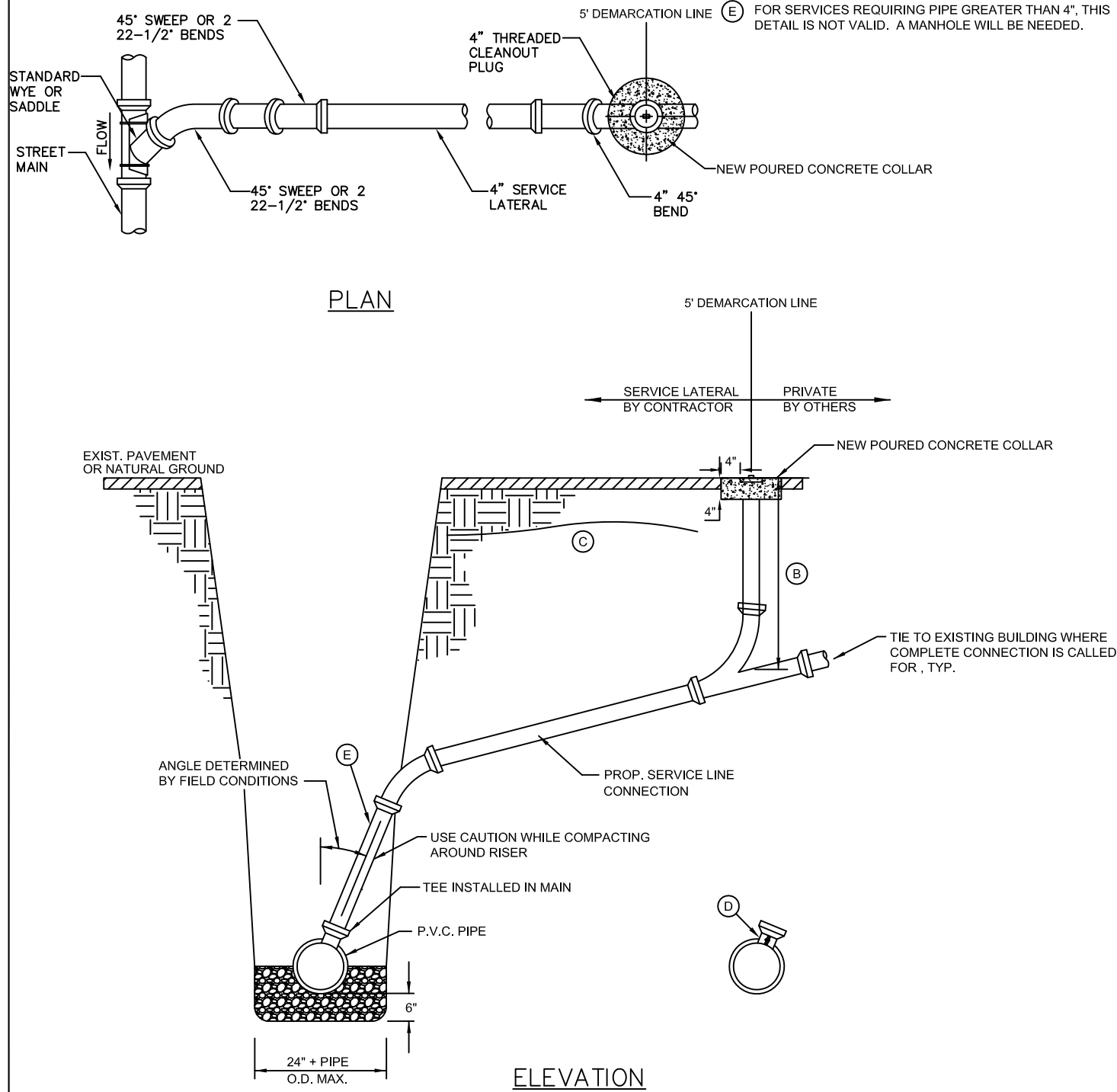







CONSTRUCTION KEY NOTES:

- (A) CONTRACTOR TO INSTALL SEWER SERVICE LINE FROM THE MAIN TO A LOCATION 6" BEHIND THE CURB OR 18" BEYOND THE EDGE OF PAVEMENT,
- (B) 3.5' MINIMUM.
- (C) PLASTIC METALLIC MARKING TAPE RISING TO WITHIN 6" OF GROUND SURFACE OR METALLIC DISK.
- (D) IF A NEW SERVICE IS REQUIRED ON AN EXISTING SEWER, A TAPPING SLEEVE OR MANHOLE WILL BE USED.
- (E) FOR SERVICES REQUIRING PIPE GREATER THAN 4", THIS DETAIL IS NOT VALID. A MANHOLE WILL BE NEEDED.



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: SEWER SERVICE LATERAL



PALMETTO STATE UTILITY SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

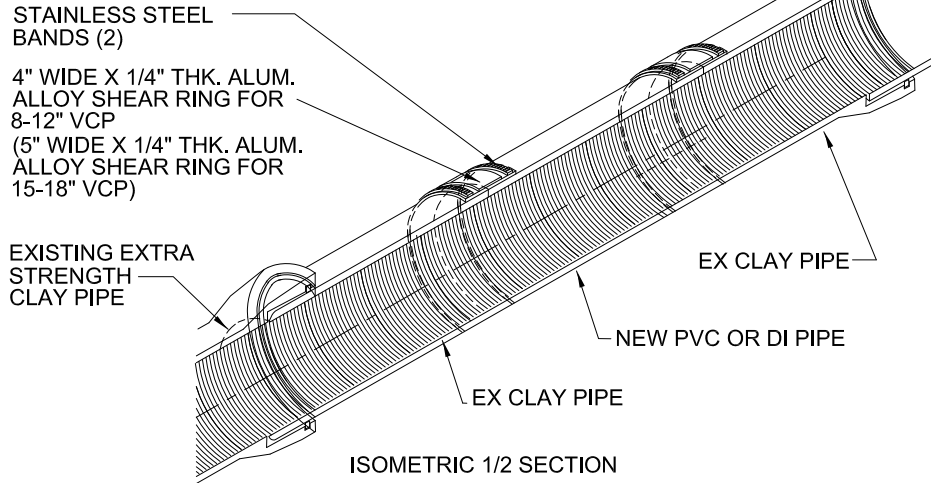
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Friday, May 27, 2011

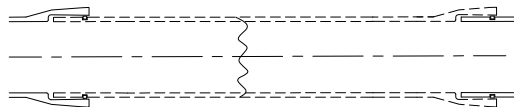




## NOTES:

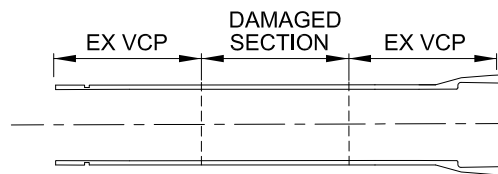
1. SANITARY SEWER REPAIR OF VCP MUST BE APPROVED BY PSUS PRIOR TO MAKING THE REPAIR, OTHERWISE, THE CONTRACTOR SHALL BE REQUIRED TO REMOVE AND RELAY ANY DAMAGED SECTIONS OF PIPE TO NEAREST MANHOLE.
2. ALL MATERIALS OF CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF PSUS.
3. CONTRACTOR SHALL PROVIDE ALL NECESSARY PUMPS, HEADER PIPE, PUMPING EQUIPMENT ETC. PRIOR TO BEGINNING CONSTRUCTION. DUPLICATE SEWAGE HANDLING PUMPS, PIPING ETC. SHALL BE ON-SITE AND AVAILABLE FOR IMMEDIATE USE SHOULD PRIMARY PUMP OR FORCE MAIN FAIL.
4. WHERE PIPE FAILURE OF EXISTING SYSTEM OCCURS AT THE BELL AND TWO PIECES OF PIPE ARE DAMAGED, BOTH PIECES OF PIPE SHALL BE COMPLETELY REMOVED.
5. PIPE REPAIR SHALL EXHIBIT STRAIGHT HORIZONTAL ALIGNMENT AND INVERT SHALL BE THE SAME AS THE EXISTING PIPE SLOPE. DEFLECTIONS OF HORIZONTAL AND VERTICAL ALIGNMENT ARE NOT ACCEPTABLE.
6. PIPE SHALL BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS AND PSUS DRAWING S6 SEWER BEDDING

## DAMAGED VCP



CONTACT PSUS FOR ACTIVE SEWAGE HANDLING REQUIREMENT'S PRIOR TO BEGINNING WORK. INSURE ADEQUATE PUMP'S, HEADER PIPING, ETC. ARE PROPERLY SIZED AND OPERATIONAL BEFORE BEGINNING WORK. REMOVE EXISTING VCP SEWER PIPE BY "CUTTING" OUT, DO NOT DAMAGE EXISTING ADJACENT PIPE SECTIONS TO REMAIN.

## STEP ONE

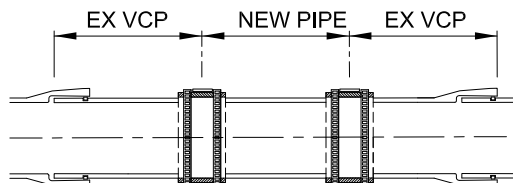


## STEP TWO



PRE-POSITION ELASTOMERIC COUPLINGS AND ALUM. ALLOY SHEAR RING REPAIR OVER NEW JOINT OF PIPE AND PLACE NEW PIPE INTO REMOVED AREA. PROPERLY BED NEW PIPE. INSURE THAT PIPE WILL FIT INTO VOID CREATED BY PIPE REMOVAL.

## STEP THREE

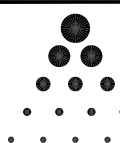


CENTER ELASTOMERIC COUPLINGS ON PIPE OVER CUT 'S MADE IN STEP TWO, CENTER COUPLING ON THE CUT JOINT. INSTALL STAINLESS STEEL BANDS (2 PER COUPLING) AND SHEAR RINGS. INSTALL REMAINDER OF STONE BEDDING SEE PSUS DETAIL S6

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

VCP SANITARY SEWER REPAIR



**PALMETTO STATE UTILITY  
SERVICES, INC.**

A Subsidiary of American States Utility Services, Inc.

• Building 2576, Essayons Way Fort Jackson, SC 29207  
• Tel: (803) 790-7288 Fax: (803) 787-2054

## REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		NEW SHEET	SFM	3-16-09	

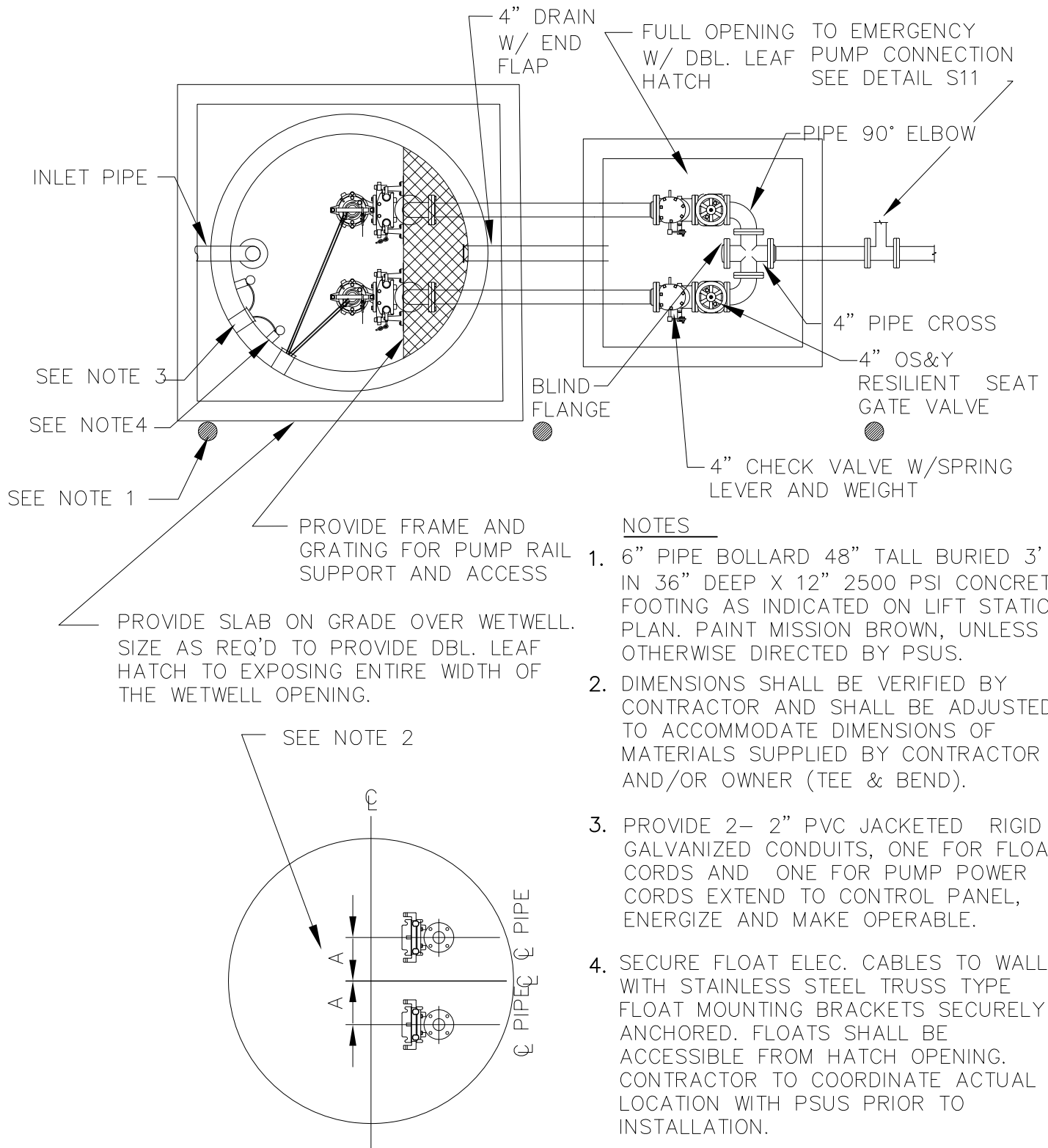
SCALE:

NTS

Friday, May 27, 2011

S7





## NOTES

1. 6" PIPE BOLLARD 48" TALL BURIED 3' IN 36" DEEP X 12" 2500 PSI CONCRETE FOOTING AS INDICATED ON LIFT STATION PLAN. PAINT MISSION BROWN, UNLESS OTHERWISE DIRECTED BY PSUS.
2. DIMENSIONS SHALL BE VERIFIED BY CONTRACTOR AND SHALL BE ADJUSTED TO ACCOMMODATE DIMENSIONS OF MATERIALS SUPPLIED BY CONTRACTOR AND/OR OWNER (TEE & BEND).
3. PROVIDE 2- 2" PVC JACKETED RIGID GALVANIZED CONDUITS, ONE FOR FLOAT CORDS AND ONE FOR PUMP POWER CORDS EXTEND TO CONTROL PANEL, ENERGIZE AND MAKE OPERABLE.
4. SECURE FLOAT ELEC. CABLES TO WALL WITH STAINLESS STEEL TRUSS TYPE FLOAT MOUNTING BRACKETS SECURELY ANCHORED. FLOATS SHALL BE ACCESSIBLE FROM HATCH OPENING. CONTRACTOR TO COORDINATE ACTUAL LOCATION WITH PSUS PRIOR TO INSTALLATION.

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## LIFT STATION PLAN

PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	1	NEW SHEET	SFM	3-16-09	
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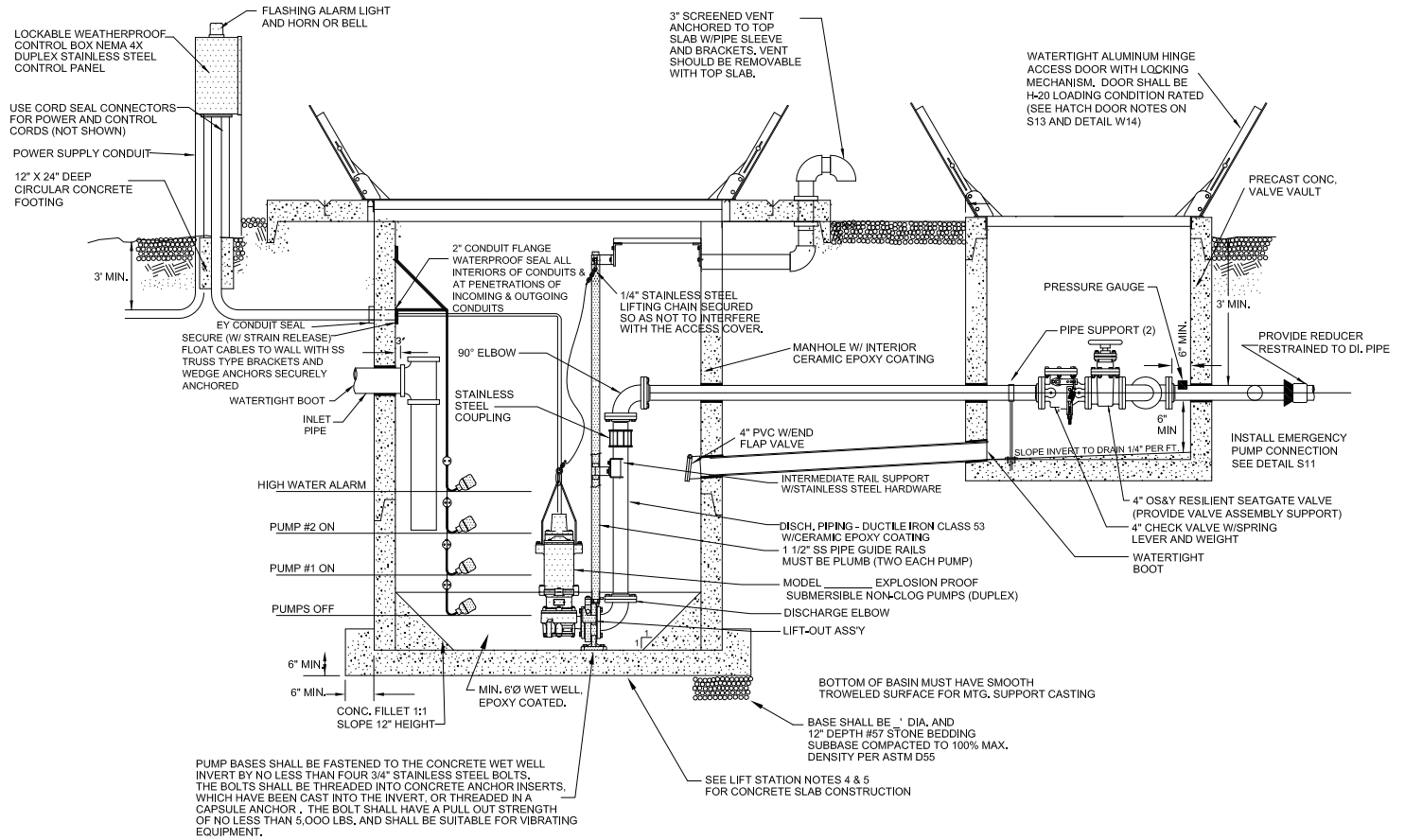
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DRAWING NUMBER

Friday, May 27 <sup>\$9</sup>

Friday, May 27, 2011



- NOTES TO DESIGNER
- 1. LAG PUMP LOCK-OUT USED WHEN TWO PUMPS RUNNING SIMULTANEOUSLY DOES NOT PROVIDE A SUBSTANTIAL INCREASE IN FLOW WHEN COMPARED TO ONE PUMP RUNNING.
  - 2. DESIGNER SHALL COORDINATE PUMP AND EQUIPMENT PURCHASE WITH PSUS
  - 3. ELEVATIONS ARE TO BE DESIGNED TO SUIT EACH INDIVIDUAL PROJECT CONDITIONS.
  - 4. LIFT STATION DESIGN TO BE DESIGNED TO MEET ALL MINIMUM STATE REQUIREMENTS.

SYSTEM HEADLOSS CURVE	
GPM	TDH

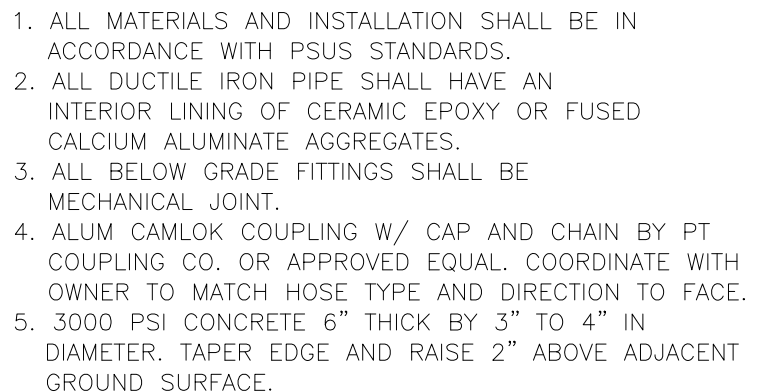
STATIC HEAD \_\_\_\_\_ GPM @ \_\_\_\_\_' TDH  
PUMPING RATE \_\_\_\_\_  
ONE PUMP OPERATING WITH  
LAG PUMP LOCK OUT. IF  
LEAD PUMP DOES NOT COME  
ON, LAG WILL COME ON. ONE  
PUMP WILL RUN INDEPENDENTLY  
ON EACH CYCLE ALTERNATELY.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: LIFT STATION SECTION

**PALMETTO STATE UTILITY SERVICES, INC.**  
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Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS						SCALE: <b>NTS</b> Friday, May 27, 2011 <b>S10</b>
ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
	1	NEW SHEET	SFM	3-16-09		



## EMERGENCY CONNECTION



PALMETTO STATE UTILITY  
SERVICES, INC.

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- Tel: (803) 790-7288 Fax: (803) 787-2054

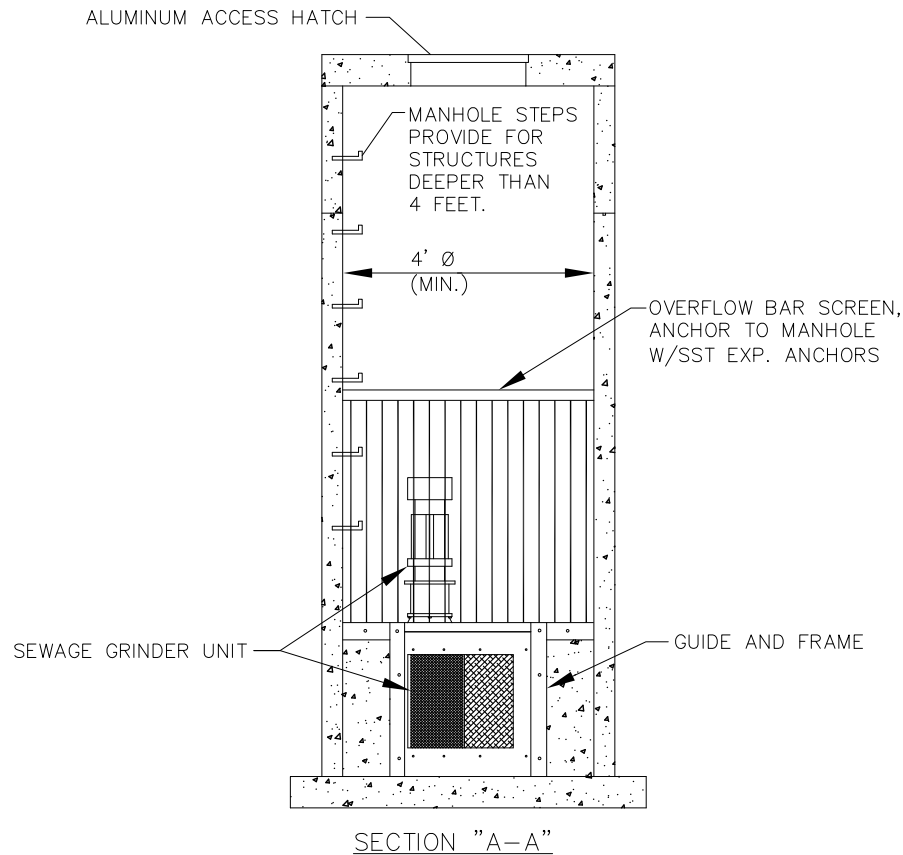
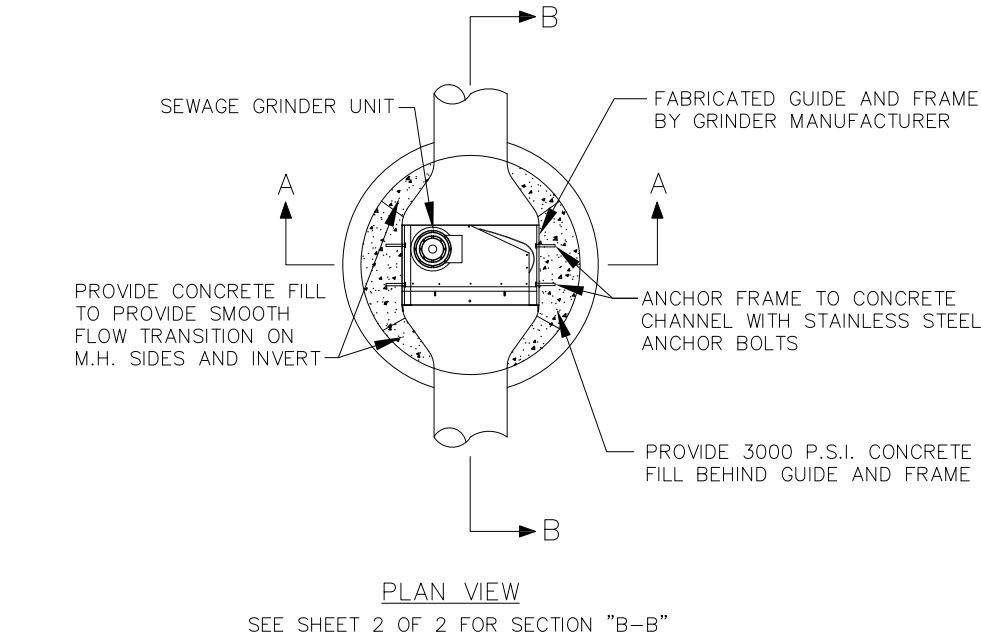
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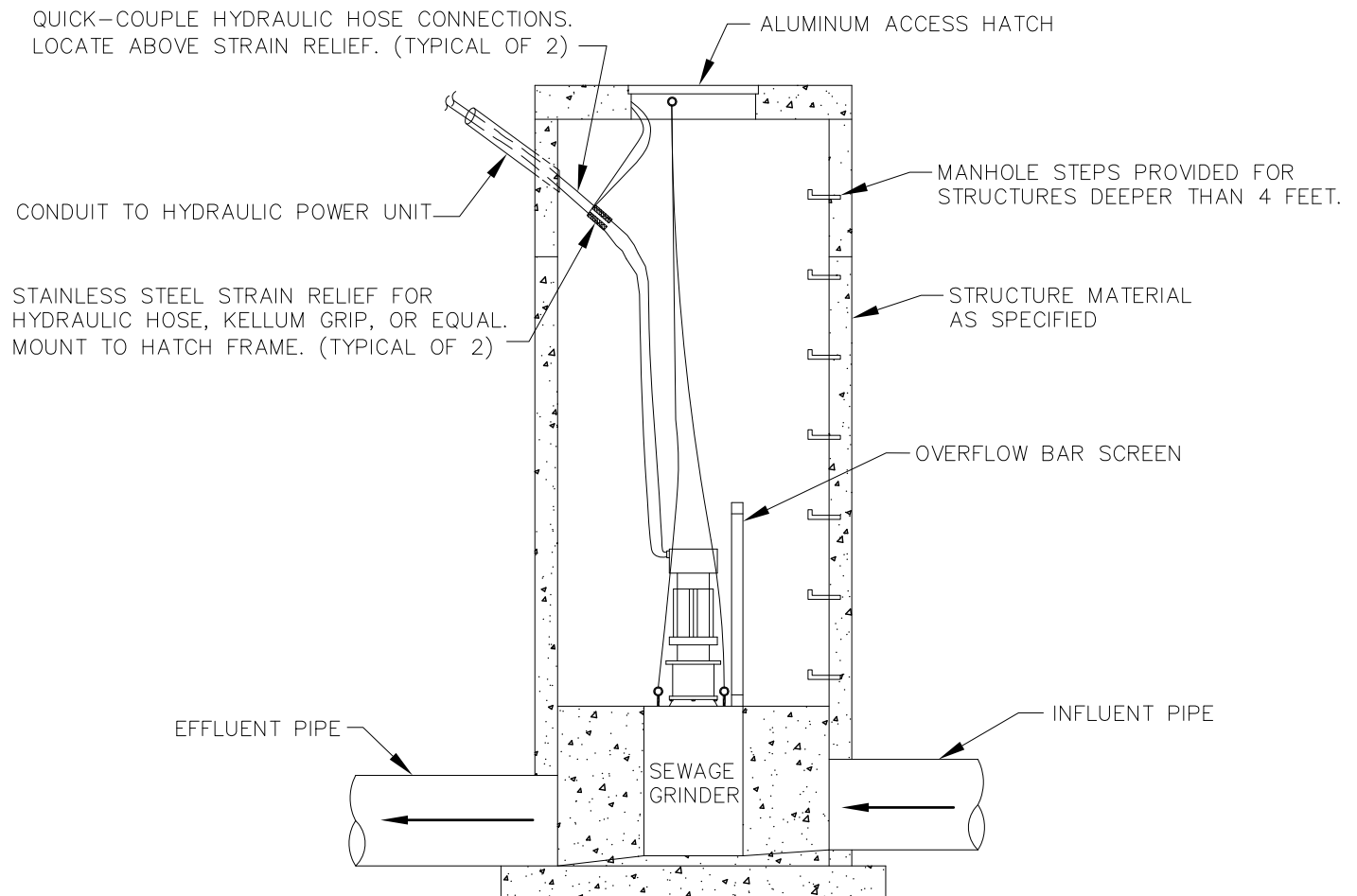


- NOTES:
- 1. THERE SHALL ONLY BE A SINGLE INFLUENT LINE INTO THE GRINDER MANHOLE.
  - 2. GRINDER MANHOLES SHALL BE EPOXY COATED.
  - 3. GRINDERS SHALL BE PROVIDED ON ALL NEW SANITARY SEWER LIFT STATIONS INSTALLED DOWNSTREAM OF CAPITAL PROJECTS AT FORT JACKSON THAT INCLUDE TROOP LIVING QUARTERS. JWC ENVIRONMENTAL MUFFIN MONSTER GRINDERS, OR EQUAL, ARE APPROVED BY PSUS FOR USE AT FORT JACKSON.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON				TITLE: SEWER GRINDER UNIT - SECTION "A-A"			
 PALMETTO STATE UTILITY SERVICES, INC. A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054	REVISIONS						SCALE:
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	NTS
			NEW SHEET	SFM	3-16-09		DRAWING NUMBER
							812

Friday, May 27, 2011





SECTION "B-B"

SEE SHEET S12 FOR PLAN VIEW AND SECTION "A-A"

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: SEWER GRINDER UNIT - SECTION "B-B"

PALMETTO STATE UTILITY  
SERVICES, INC.

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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	1	NEW SHEET	SFM	3-16-09	
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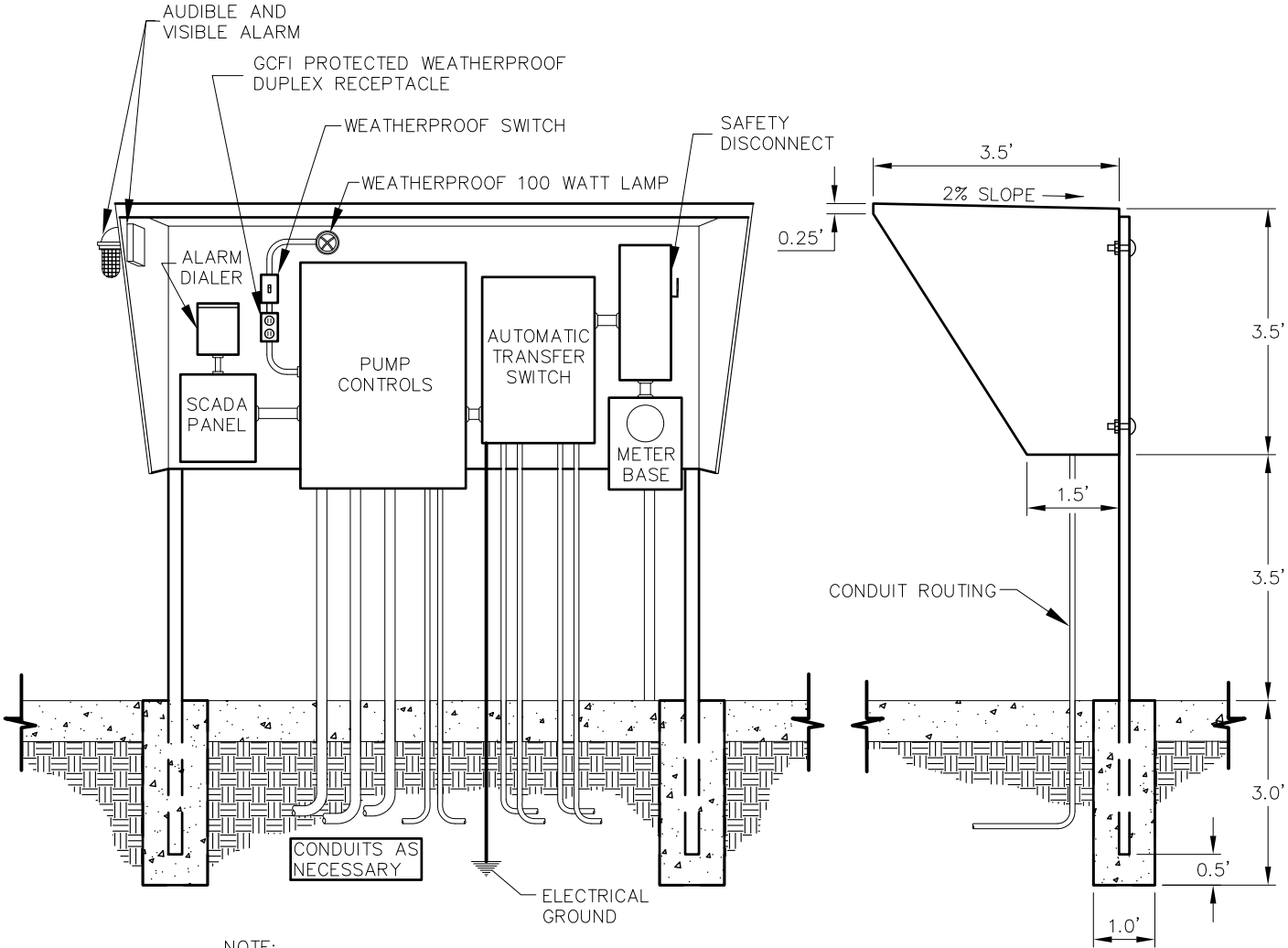
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DRAWING NUMBER

S13\_

Friday, May 27, 2011




NOTE:  
ALL ELECTRICAL SYSTEMS SHALL MEET OR EXCEED NEC REQUIREMENTS.

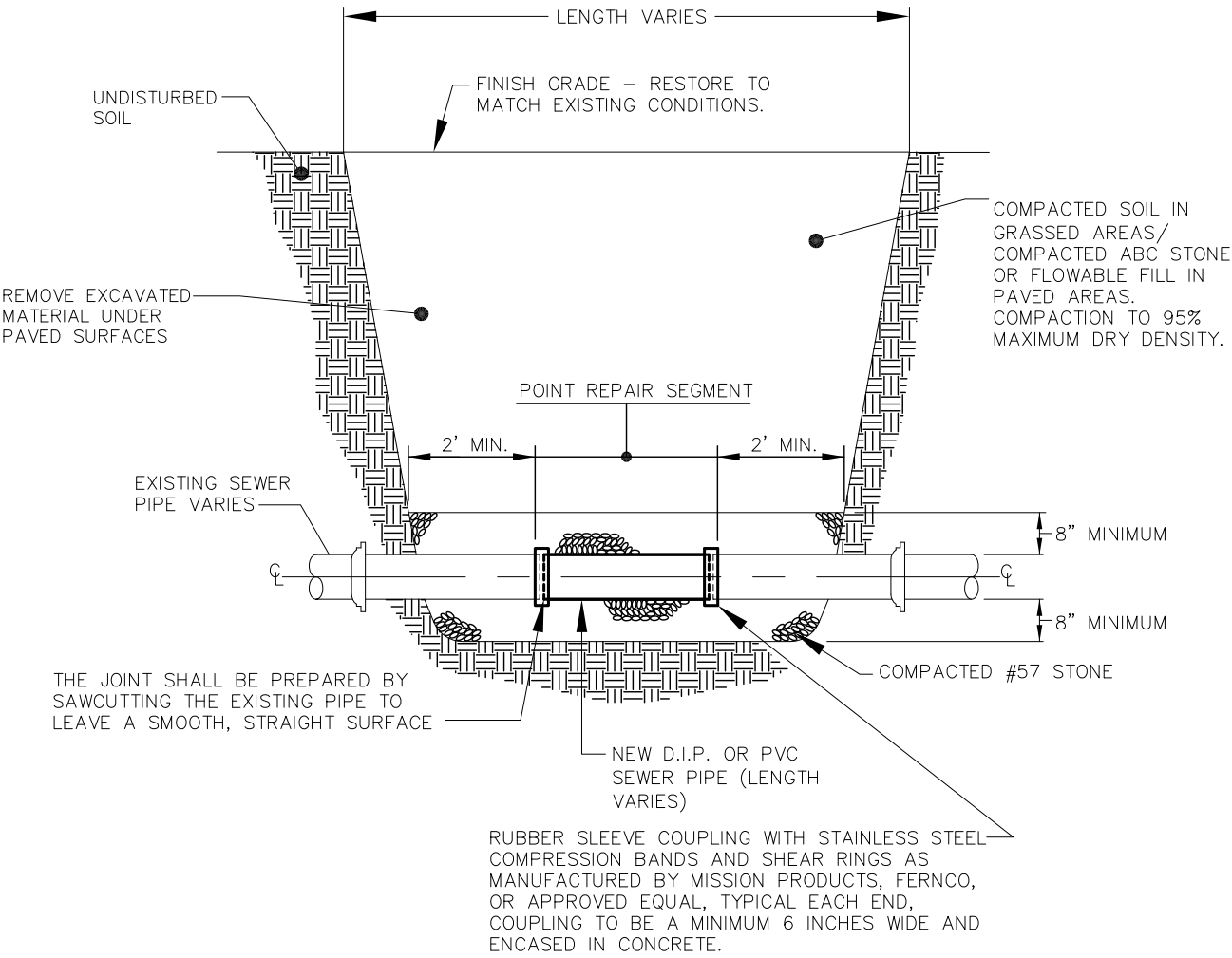
### LIFT STATION NOTES

1. CONCRETE SHALL BE 4,000 PSI COMPRESSION STRENGTH.
2. MANHOLE SHALL MEET REQUIREMENTS OF ASTM C-478.
3. ALL ELECTRICAL MATERIAL & INSTALLATION SHALL BE BY A LICENSED ELECTRICIAN AND IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, AND RULES AND REGULATIONS OF FORT JACKSON. MATERIALS SHALL BE LISTED OR LABELED BY THE UNDERWRITERS LABORATORIES STANDARDS.
4. LIFT STATION MANHOLE CONCRETE SLAB AND HATCH SHALL BE MANUFACTURED TO WITHSTAND H-20 LOADING CONDITIONS.
5. MANUFACTURER SHALL BE REQUIRED TO SUBMIT DESIGN CALCULATIONS SIGNED AND SEALED BY A PROFESSIONAL ENGINEER WITH SHOP DRAWINGS AND REVIEW SUBMITTAL.
6. SHOP DRAWINGS AND WIRING DIAGRAMS SHALL BE PROVIDED FOR ALL ELECTRICAL EQUIPMENT.
7. ENGINEER TO DESIGN FOUNDATION BED AND APPROVE FOUNDATION BED BEFORE SETTING LIFT STATION STRUCTURES.
8. CONTRACTOR IS TO PROVIDE DEWATERING EQUIPMENT AS REQUIRED FOR CONSTRUCTION AT NO ADDITIONAL COST TO PSUS.
9. HATCH DOORS AND CONTROL PANEL BOX SHALL BE LOCKABLE AND KEYED TO PSUS MASTER LOCK SYSTEM. CONTRACTOR SHALL FURNISH 3 LOCKS AND KEYS.
10. CONTRACTOR SHALL INSTALL ALL PSUS FURNISHED EQUIPMENT AS REQUIRED AND PROVIDE START UP AND TRAINING SERVICES (MIN. 2 DAYS).
11. CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO MAKE THE LIFT STATION FULLY OPERATIONAL AND IN ACCORDANCE WITH PSUS STANDARDS.
12. RECESSED LIFTING HOOKS SHALL BE PLACED IN CONCRETE WET WELL COVER. CONTROL PANEL BOX SHALL BE ANCHORED IN 12" X 24" DEEP CONCRETE FOOTING (SEE DETAIL.).
13. CONTRACTOR SHALL PROVIDE ALL NECESSARY LUBRICANTS FOR STARTUP AND SHALL ASSIST THE EQUIPMENT MANUFACTURER AND PSUS WITH INITIAL STARTUP (MIN. 2 DAYS).
14. PIPEWORK SHALL BE ASSEMBLED, INSTALLED, AND FULLY SUPPORTED SO AS NOT TO PUT A STRAIN ON THE PUMPING EQUIPMENT, PIPE FITTINGS AND ELBOWS.
15. ALL THRU-THE-WALL SLEEVES AND CARRIER PIPES INTO THE WET WELL SHALL BE INSTALLED ABSOLUTELY WATERTIGHT WITH NO SIGNS OF SEEPAGE OR INFILTRATION.
16. ENTIRE SITE SHALL BE FENCED FOR SECURITY. CONTRACTOR SHALL PROVIDE LOCKS FOR GATE OPENING.
17. ALL HANGERS, CLAMPS, FLANGE BOLTS, AND CONNECTIONS SHALL BE STAINLESS STEEL UNLESS OTHERWISE SPECIFIED. THESE ITEMS TO BE FURNISHED AND INSTALLED BY THE CONTRACTOR.
18. ALL DIMENSIONS SHALL BE VERIFIED BY CONTRACTOR AND SHALL BE ADJUSTED TO ACCOMMODATE DIMENSIONS OF MATERIALS SUPPLIED BY CONTRACTOR AND ONUS.
19. CONCRETE FACES SHALL BE SERRATED.

## HATCH DOOR NOTES

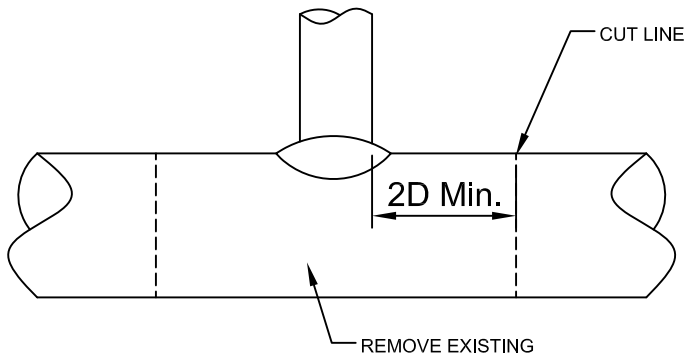
1. HATCH SHALL BE, RATED H-20 LOADING AND INCLUDE CHANNEL FRAMING AND ALUMINUM DIAMOND PATTERN PLATE DOOR.
2. HATCH DOORS SHALL BE WATERTIGHT EQUIPPED W/NEOPRENE GASKET, HINGED WITH LOCKING MECHANISM, AND AUTOMATIC HOLD OPEN ARM.
3. SET DOOR UNIT WITH SLIGHT PITCH TOWARD DRAIN.
4. DO NOT RACK OR TWIST FRAME WHEN SETTING UNIT. BLOCK UP AND SHIM THE FRAME IF NECESSARY TO BE SURE COVERS REST EVENLY ON FRAME ALL AROUND.
5. DO NOT REDUCE 1-1/2"(38mm) PIPE TO DRY WELL OR DISPOSAL SYSTEM.
6. SUPPORT SHELF MUST BE SUPPORTED BY CONCRETE OR STEEL TO CARRY H-20 LOADING.
7. ALL HARDWARE SHALL BE ZINC PLATED STEEL-CHROMATE SEALED OR STAINLESS.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON					TITLE: LIFT STATION NOTES				
 <p><b>PALMETTO STATE UTILITY SERVICES, INC.</b> A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054</p>		REVISIONS						SCALE:	
		ZONE	REV.	DESCRIPTION	BY	DATE	APP.	NTS	
				NEW SHEET	SFM	3-16-09		DRAWING NUMBER	
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								Friday, May 27, 2011	

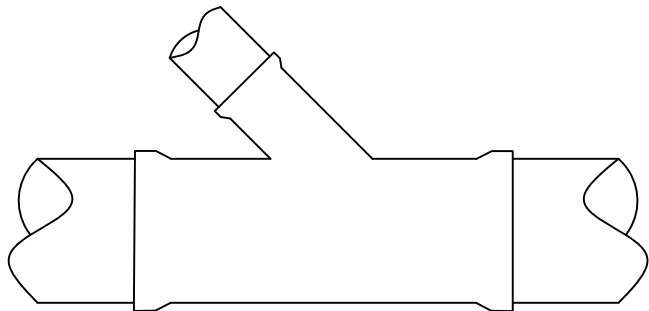


GENERAL NOTES:

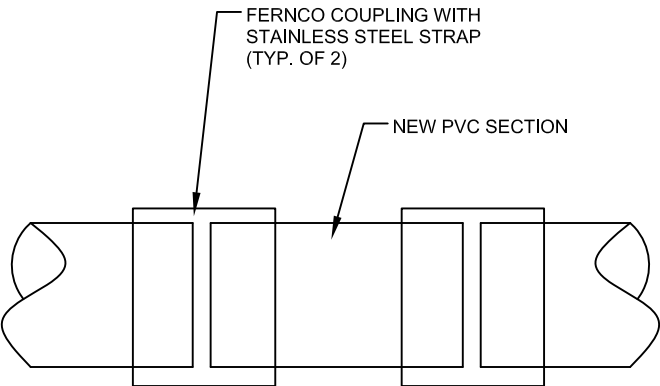
1. INSERT NEW PVC PIPE SECTION PER STANDARD DETAIL S16.



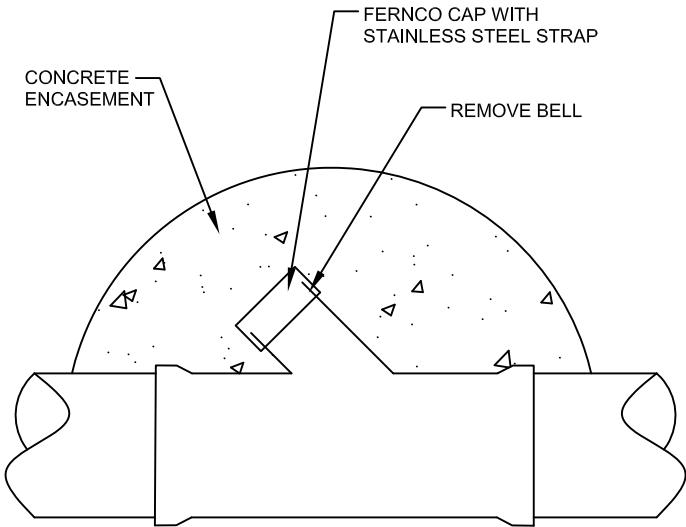
EXISTING HAMMER TAP LATERAL



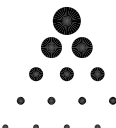
EXISTING WYE FITTING LATERAL

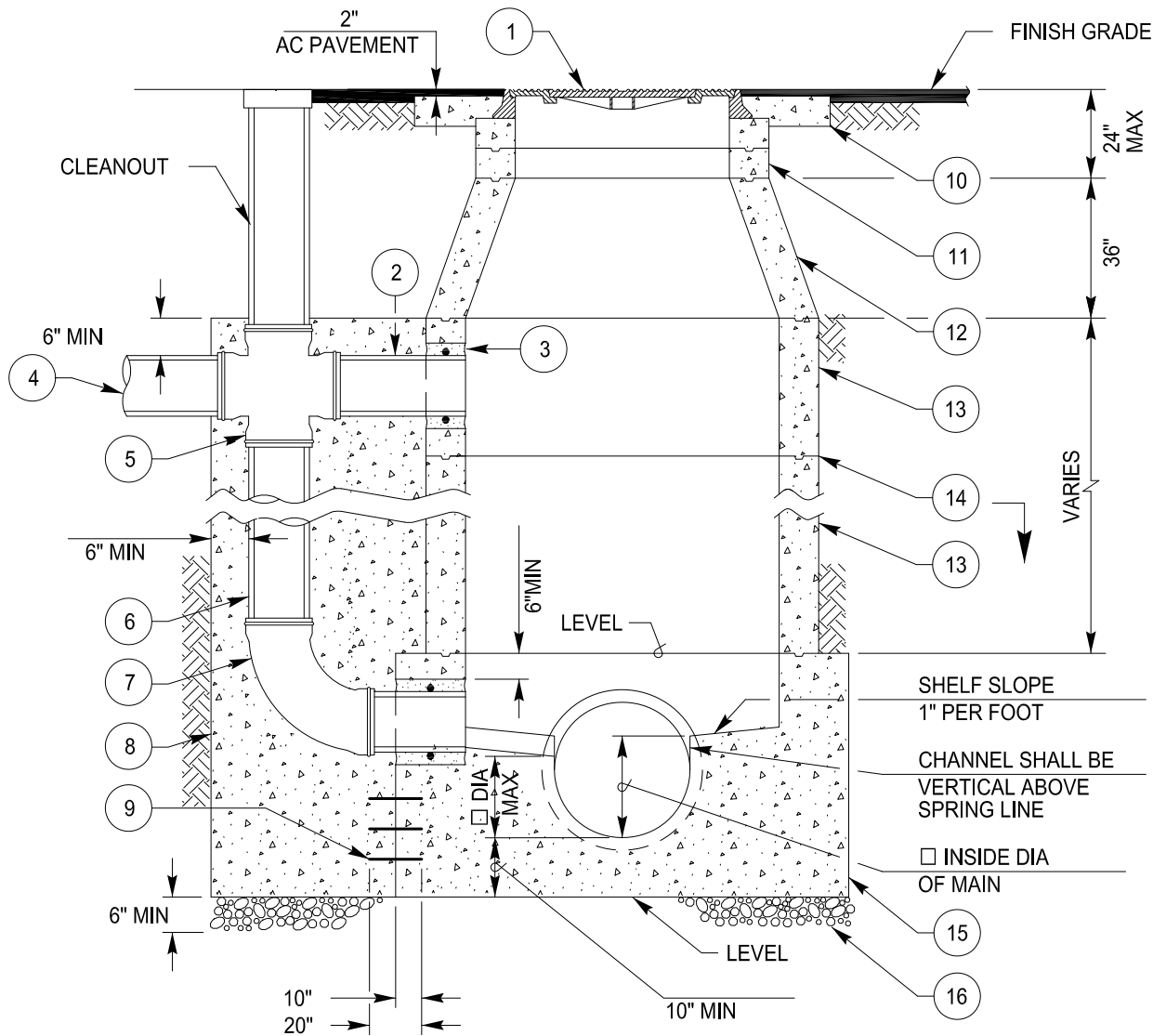


ABANDONED HAMMER TAP LATERAL  
(SEE NOTE #1)



ABANDONED WYE FITTING LATERAL

STANDARD CONSTRUCTION DRAWING - FORT JACKSON					TITLE: SEWER LATERAL ABANDONMENT				
 <div><b>PALMETTO STATE UTILITY SERVICES, INC.</b> A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054</div>	REVISIONS						SCALE: NTS		
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	DRAWING NUMBER		
			NEW SHEET	SFM	3-16-09		S17		
							Friday, May 27, 2011		



ITEM NO	SIZE AND DESCRIPTION	ITEM NO	SIZE AND DESCRIPTION
1	24" MANHOLE FRAME AND TWO CONCENTRIC COVERS	10	6" HIGH x 12" WIDE CONCRETE RING
2	SIZE x 12" LONG SEWER PIPE	11	24" DIA GRADE RING(S) 6" TO 18" HIGH
3	MANHOLE PIPE CONNECTOR SEE S4	12	ECCENTRIC CONE
4	SEWER PIPE	13	48" DIA RING(S) VARIABLE HEIGHT
5	SIZE x SIZE GASKETED TEE	14	WATER TIGHT JOINTS
6	DROP SEWER PIPE AS REQUIRED	15	CONCRETE BASE, CAST IN PLACE OR PRECAST
7	SIZE x 90° GASKETED LONG RADIUS BEND	16	6" OF CRUSHED ROCK
8	CONCRETE ENCASEMENT		
9	#4 BARS @ 6" ON CENTER EPOXIED INTO EXISTING MANHOLE BASE		

STANDARD CONSTRUCTION SPECIFICATIONS FOR WATER SYSTEMS

THIS SHOULD BE USED AS A GENERAL GUIDE. SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL REGULATIONS R.61-58 SHALL BE USED FOR SPECIFIC DESIGN CRITERIA. THE INFORMATION REQUIRED BY R.61-58 INCLUDES THE APPROPRIATE SECTION FOR REFERENCE.

GENERAL REQUIREMENTS:

- CONSTRUCTION SPECIFICATIONS MUST BE SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER. THE SPECIFICATIONS SHOULD INCLUDE THE ENGINEERING FIRM'S CORPORATE SEAL ALONG WITH THE SEAL AND SIGNATURE OF ALL ENGINEERS OF THE FIRM UTILIZING THESE SPECIFICATIONS. (R.61-58.1.F)
- ALL STANDARDS CITED IN THE TEXT REFER TO THE LATEST REVISION OF THAT STANDARD UNDER THE SAME SPECIFICATION NUMBER OR TO SUPERSEDING SPECIFICATIONS UNDER A NEW NUMBER.

MATERIALS REQUIREMENTS:

- ALL MATERIAL OR PRODUCTS WHICH COME INTO CONTACT WITH DRINKING WATER SHALL BE THIRD PARTY CERTIFIED AS MEETING THE SPECIFICATIONS OF THE AMERICAN NATIONAL INSTITUTE/NATIONAL SANITATION FOUNDATION STANDARD 61, DRINKING WATER SYSTEM COMPONENTS - HEALTH EFFECTS. THE CERTIFYING PARTY SHALL BE ACCREDITED BY THE AMERICAN NATIONAL STANDARDS INSTITUTE. (R.61-58.4.D.(1))
- ALL PIPE, FITTINGS, PACKING, JOINTING MATERIALS, VALVES AND FIRE HYDRANTS SHALL CONFORM TO SECTION C OF THE AWWA STANDARDS. (R.61-58.4.D.(1))
- WATER MAINS WHICH HAVE BEEN PREVIOUSLY USED FOR CONVEYING POTABLE WATER MAY BE REUSED PROVIDED THEY MEET APPLICABLE CRITERIA FROM AWWA SECTION C, ANSI/NSF 61, AND ASTM D1785 OR D2241. THE MAINS MUST BE THOROUGHLY CLEANED AND RESTORED PRACTICALLY TO THEIR ORIGINAL CONDITION. (R.61-58.4.D.(2))
- ASBESTOS CEMENT PIPE SHALL NOT BE USED IN POTABLE WATER SYSTEMS EXCEPT IN THE REPAIR OF EXISTING ASBESTOS CEMENT LINES. (R.61-58.4.D.(1))
- THERMOPLASTIC PIPE SHALL NOT BE USED ABOVE GRADE. (R.61-58.4.D.(1))
- MATERIALS SHALL MEET THE FOLLOWING:
  - DIP: AWWA C150/A21.50 & AWWA C151/A21.51.
  - PVC: AWWA C900 (FOR PIPES 4 INCHES THROUGH 12 INCHES IN DIAMETER).
  - PVC: ASTM D1785 OR ASTM D2241: SD 26 CLASS 160 AND SD 21 CLASS 200 (FOR PIPES 12 INCHES IN DIAMETER AND SMALLER).
  - PVC: AWWA C905 (FOR PIPES 14 INCHES THROUGH 48 INCHES IN DIAMETER).
  - STEEL: AWWA C200 OR ASTM A53 OR A120.
  - VALVES: AWWA C500 (METAL SEATED GATE VALVE) , C504 (BUTTERFLY VALVE) OR C509 (RESILIENT SEATED GATE VALVE).
  - HYDRANTS: AWWA C502.
- NATURAL RUBBER OR OTHER MATERIAL WHICH WILL SUPPORT MICROBIOLOGICAL GROWTH MAY NOT BE USED FOR ANY GASKETS, O-RINGS, AND OTHER PRODUCTS USED FOR JOINTING PIPES, SETTING METERS OR VALVES, OR OTHER APPURTENANCES WHICH WILL EXPOSE THE MATERIAL TO THE WATER. (R.61-58.4.D.(3))
- LUBRICANTS WHICH WILL SUPPORT MICROBIOLOGICAL GROWTH SHALL NOT BE USED FOR SLIP-ON JOINTS. ( R.61-58.4.D.(3))
- THE USE OF VEGETABLE SHORTENING IS PROHIBITED. (R.61-58.4.D.(3))
- THE USE OF SOLVENT-WELD PVC PIPE AND FITTINGS IN WATER MAINS 4 INCHES AND LARGER IS PROHIBITED. (R.61-58.4.D.(3))
- ANY PIPE, SOLDER, OR FLUX WHICH IS USED IN THE INSTALLATION OR REPAIR OF ANY PUBLIC WATER SYSTEM, USED IN ANY PLUMBING WHICH PROVIDES WATER THROUGH CONNECTION TO A PUBLIC WATER SYSTEM, FOR HUMAN CONSUMPTION, SHALL BE LEAD FREE. LEAD FREE, FOR SOLDER AND FLUX, MEANS THOSE CONTAINING NOT MORE THAN 0.2% LEAD. LEAD FREE, FOR PIPES AND PIPE FITTINGS, AS THOSE CONTAINING NOT MORE THAN 8.0% LEAD. LEADED JOINTS NECESSARY FOR THE REPAIR OF CIP SHALL BE EXEMPT FROM THE ABOVE. (R.61-58.4.F.(1)-(5))

INSTALLATION REQUIREMENTS:

- ☐ NO FLUSHING DEVICE SHALL BE DIRECTLY CONNECTED TO ANY SEWER. (R.61-58.4.D.(7)(F))
- ☐ AIR RELIEF VALVES SHALL BE PROVIDED IN ACCORDANCE WITH SOUND ENGINEERING PRACTICE AT HIGH POINTS IN WATER MAINS AS REQUIRED. AUTOMATIC AIR RELIEF VALVES SHALL NOT BE USED IN SITUATIONS WHERE FLOODING OF THE MANHOLE OR CHAMBER MAY OCCUR. (R.61-58.4.D.(10)(A))
- ☐ CHAMBERS, PITS OR MANHOLES CONTAINING VALVES, BLOW-OFFS, METERS, AIR RELIEF VALVES, OR OTHER SUCH APPURTENANCES TO A DISTRIBUTION SYSTEM, SHALL NOT BE CONNECTED DIRECTLY TO ANY STORM DRAIN OR SANITARY SEWER. (R.61-58.4.D.(10)(C))
- ☐ INSTALLATION OF WATER MAINS AND APPURTENANCES SHALL BE CONDUCTED IN ACCORDANCE WITH SECTION C OF THE AWWA STANDARDS AND/OR MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES. (R.61-58.4.D.(11)(A))
- ☐ BEDDING: (R.61-58.4.D.(11)(B))

☐ A CONTINUOUS AND UNIFORM BEDDING SHALL BE PROVIDED IN THE TRENCH FOR ALL BURIED PIPE.

☐ BACK-FILL MATERIAL SHALL BE TAMPED IN LAYERS AROUND THE PIPE AND TO A SUFFICIENT HEIGHT ABOVE THE PIPE TO ADEQUATELY SUPPORT AND PROTECT THE PIPE.

☐ STONES, OTHER THAN CRUSHED BEDDING, SHALL NOT COME IN CONTACT WITH THE PIPE AND SHALL NOT BE WITHIN 6 INCHES OF THE PIPE.
- ☐ ALL WATER MAINS SHALL BE PROVIDED WITH A MINIMUM OF 30 INCHES OF COVER, UNLESS PIPE MATERIAL IS STEEL, CONCRETE, DIP, OR OTHER APPROVED MATERIAL, AND IF EXPOSED SHOULD BE INSULATED TO PREVENT FREEZING. (R.61-58.4.D.(11)(C))
- ☐ ALL TEES, BENDS, PLUGS AND HYDRANTS ON LINES 2.5 INCHES IN DIAMETER AND LARGER SHALL BE PROVIDED WITH REACTION BLOCKING, TIE RODS, OR OTHER APPROVED METHOD OF RESTRAINT. (R.61-58.4.D.(11)(D))
- ☐ ALL WATER MAINS SHALL BE DETECTABLE WITHIN 3 FEET WITH ELECTRONIC LOCATING EQUIPMENT. (R.61-58.4.D.(11)(G))
- ☐ NON-METALLIC PIPES SHALL BE INSTALLED WITH COPPER WIRE OR OTHER MEANS OF DETECTION. (R.61-58.4.D.(11)(G))
- ☐ WATER MAINS SHALL BE LOCATED OUT OF CONTAMINATED AREAS, UNLESS USING PIPE MATERIALS THAT WILL PROTECT (I.E., DIP WITH CHEMICAL RESISTANT GASKETS). RE-ROUTE LINE IF POSSIBLE. (R.61-58.4.D.(11)(H))
- ☐ SEPARATION OF WATER MAINS AND SEWERS: (R.61-58.4.D.(12)(A)-(F))

☐ PARALLEL INSTALLATION: WATER MAINS SHALL BE LAID AT LEAST 10 FEET HORIZONTALLY FROM ANY EXISTING OR PROPOSED SEWER. THE DISTANCE SHALL BE MEASURED EDGE TO EDGE. IN CASES WHERE IT IS NOT PRACTICAL TO MAINTAIN A TEN FOOT SEPARATION, THE DEPARTMENT MAY ALLOW DEVIATION ON A CASE-BY-CASE BASIS, IF SUPPORTED BY DATA FROM THE DESIGN ENGINEER. SUCH DEVIATION MAY ALLOW INSTALLATION OF THE WATER MAIN CLOSER TO A SEWER, PROVIDED THAT THE WATER MAIN IS LAID IN A SEPARATE TRENCH OR ON AN UNDISTURBED EARTH SHELF LOCATED ON ONE SIDE OF THE SEWER AT SUCH AN ELEVATION THAT THE BOTTOM OF THE WATER MAIN IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.

☐ CROSSINGS: WATER MAINS CROSSING SEWERS SHALL BE LAID TO PROVIDE A MINIMUM VERTICAL SEPARATION OF 18 INCHES BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF THE SEWER. THIS SHALL BE THE CASE WHETHER THE WATER MAIN IS EITHER ABOVE OR BELOW THE SEWER LINE. WHENEVER POSSIBLE, THE WATER MAIN SHALL BE LOCATED ABOVE THE SEWER LINE. WHERE A NEW WATER MAIN CROSSES A NEW SEWER LINE, A FULL LENGTH OF PIPE SHALL BE USED FOR BOTH THE WATER MAIN AND SEWER LINE AND THE CROSSING SHALL BE ARRANGED SO THAT THE JOINTS OF EACH LINE WILL BE AS FAR AS POSSIBLE FROM THE POINT OF CROSSING AND EACH OTHER. WHERE A NEW WATER MAIN CROSSES AN EXISTING SEWER LINE, ONE FULL LENGTH OF WATER PIPE SHALL BE LOCATED SO BOTH JOINTS WILL BE AS FAR FROM THE SEWER LINE AS POSSIBLE. WHERE A WATER MAIN CROSSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT SHALL BE PROVIDED FOR THE SEWER LINE TO PREVENT DAMAGE TO THE WATER MAIN.

☐ SPECIAL CONDITIONS: WHEN IT IS IMPOSSIBLE TO OBTAIN THE DISTANCES SPECIFIED IN R.61-58.4(D)(12)(A) AND (B) THE DEPARTMENT MAY ALLOW AN ALTERNATIVE DESIGN. ANY ALTERNATIVE DESIGN SHALL:

☐ MAXIMIZE THE DISTANCES BETWEEN THE WATER MAIN AND SEWER LINE AND THE JOINTS OF EACH;

☐ USE MATERIALS WHICH MEET THE REQUIREMENTS R.61-58.4(D)(1) FOR THE SEWER LINE; AND,

☐ ALLOW ENOUGH DISTANCE TO MAKE REPAIRS TO ONE OF THE LINES WITHOUT DAMAGING THE OTHER.

☐ FORCE MAINS: THERE SHALL BE AT LEAST A 10 FOOT HORIZONTAL SEPARATION BETWEEN WATER MAINS AND SANITARY SEWER FORCE MAINS. THERE SHALL BE AN 18 INCH VERTICAL SEPARATION AT CROSSING AS REQUIRED IN R.61-58.4(D)(12)(A) AND (B).

☐ SEWER MANHOLES: NO WATER PIPE SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SEWER MANHOLE. WATER LINES MAY COME IN CONTACT WITH STORM SEWERS OR CATCH BASINS IF THERE IS NO OTHER PRACTICAL ALTERNATIVE, PROVIDED THAT DUCTILE IRON IS USED, NO JOINTS OF THE WATER LINE ARE WITHIN THE STORM SEWER OR CATCH BASIN AND THE JOINTS ARE LOCATED AS FAR AS POSSIBLE FROM THE STORM SEWER OR CATCH BASIN.

☐ DRAIN-FIELDS AND SPRAY-FIELDS: POTABLE WATER LINES SHALL NOT BE LAID LESS THAN 25 FEET HORIZONTALLY FROM ANY PORTION OF A WASTE-WATER TILE-FIELD OR SPRAY-FIELD, OR SHALL BE OTHERWISE PROTECTED BY AN ACCEPTABLE METHOD APPROVED BY THE DEPARTMENT.

☐ ABOVE-WATER CROSSINGS: THE PIPE SHALL BE ADEQUATELY SUPPORTED AND ANCHORED, PROTECTED FROM DAMAGE AND FREEZING, ACCESSIBLE FOR REPAIR OR REPLACEMENT. (R.61-58.4.D.(13)(A))
- ☐ UNDERWATER CROSSINGS: A MINIMUM OF 2 FEET OF COVER SHALL BE PROVIDED OVER THE PIPE. WHEN CROSSING WATER COURSES THAT ARE GREATER THAN 15 FEET IN WIDTH, THE FOLLOWING SHALL BE PROVIDED: (R.61-8.4.D.(13)(B)(I)-(III))

☐ THE PIPE MATERIAL AND JOINTS SHALL BE DESIGNED APPROPRIATELY.

☐ VALVES SHALL BE LOCATED SO THE SECTION CAN BE ISOLATED FOR TESTING OR REPAIR; THE VALVES (ON BOTH SIDES OF CROSSING) SHALL BE EASILY ACCESSIBLE AND NOT SUBJECT TO FLOODING.

☐ A BLOW-OFF SHALL BE PROVIDED ON THE SIDE OPPOSITE THE SUPPLY SERVICE SIZED IN ACCORDANCE WITH SECTION R.61-58.4.(D)(7). DIRECT AWAY FROM STREAMS, OVER GROUND.

☐ USE DIP WITH MECHANICAL JOINTS FOR ANY LINES BEING INSTALLED IN ROCK.



- ☐ Cross Connection Control (Backflow Prevention Devices):
- ☐ There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system. *(R.61-58.4.D.(14)(a))*

☐ No by-passes shall be allowed, unless the bypass is also equipped with an equal, approved back-flow prevention device. *(R.61-58.4.D.(14)(a))*

☐ High hazard category cross connections shall require an air gap separation or an approved reduced pressure backflow preventer. *(R.61-58.7.F.(4))*

☐ Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. Generally, if installed in a pit, the drain line shall be 2 times the size of the line entering the backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into the pit. *(R.61-58.7.F.(5))*

☐ All piping up to the inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.

☐ Fire line sprinkler systems and dedicated fire lines, except those in the high hazard category shall be protected by an approved double check valve assembly. *(R.61-58.7.F.(6))*

Testing & Disinfection Requirements: (SEE TECHNICAL PIPELINE SPECIFICATIONS)

Construction Details:

- ☐ Fire Hydrant details shall include the following:
- ☐ Hydrant leads shall be a minimum of 6 inches in diameter and shall include auxiliary gate valves. *(R.61-58.4.D.(9)(a)(i))*

☐ A gravel pocket or dry well shall be provided unless the natural soils will provide adequate drainage. *(R.61-58.4.D.(9)(a)(ii))*

☐ Hydrant drains shall not be connected to or located within 10 feet of sewer systems. *(R.61-58.4.D.(9)(a)(iii))*

☐ Thrust blocking should not block weep holes.
- ☐ Blow-off details shall include the following:
- ☐ Blow-offs should be located in a box or other structure to facilitate proper use. The orifice should be provided on the fixed piping, in the valve box.

☐ Blow-offs should not be directed towards roads or so that the water will flow into creeks, etc. At stream crossings direct away from streams, over ground.

☐ Orifice sized as follows:

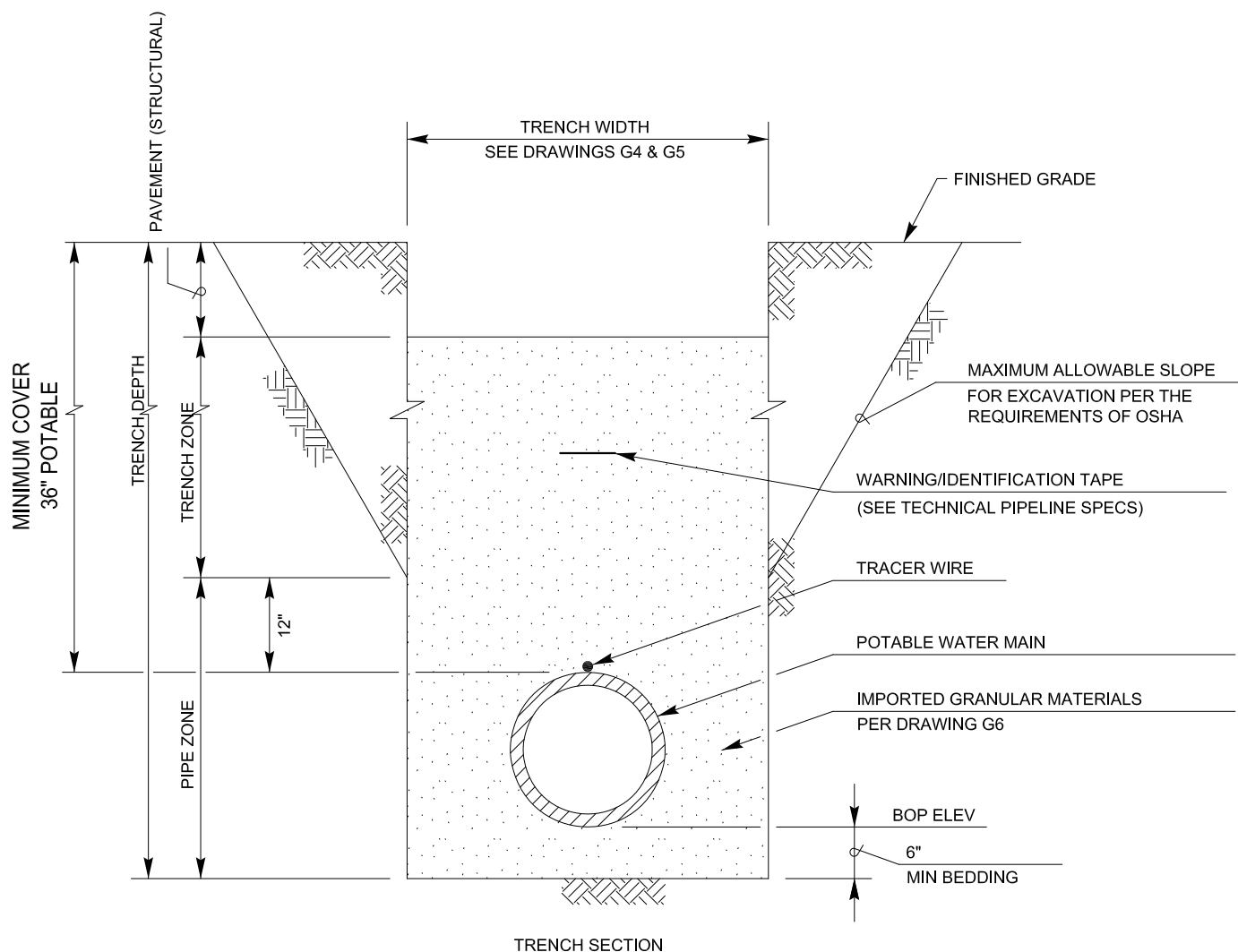
Pipe Diameter:	Minimum Flow Required:	Orifice Size:
2 inch	25 gpm	0.75 inch
2.5 inch	40 gpm	1 inch
3 inch	60 gpm	1.25 inch
4 inch	100 gpm	1.5 inch
6 inch	220 gpm	2 inch
8 inch	400 gpm	2.5 inch
10 inch	612 gpm	Fire Hydrant
12 inch	882 gpm	Fire Hydrant
14 inch	1200 gpm	Special Blow-off
16 inch	1570 gpm	Special Blow-off

☐ Air Relief Valves details shall include the following:

☐ The open end of an air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of the pit and provided with a screened downward facing elbow. *(R.61-58.4.D.(10)(b))*

☐ Thrust Blocking details.

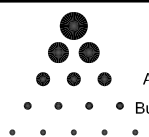
NOTE: Stream Crossings and Backflow Prevention Device details, if applicable, should be included with each project.



TRENCH SECTION

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: STANDARD WATER PIPE COVER DETAIL



PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REVISED TO SPECIFY WATER PIPE COVER	SFM	3-16-09	En

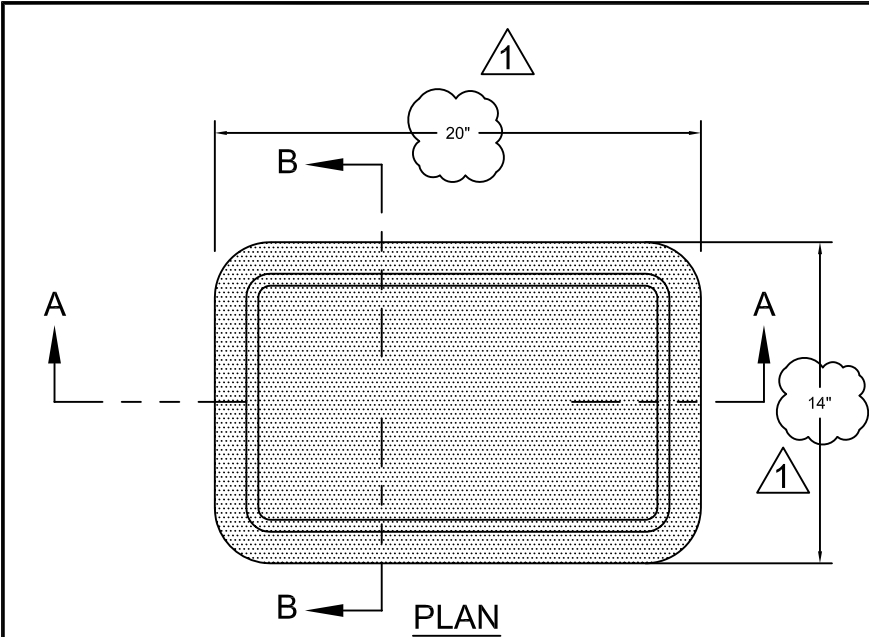
SCALE:

NTS

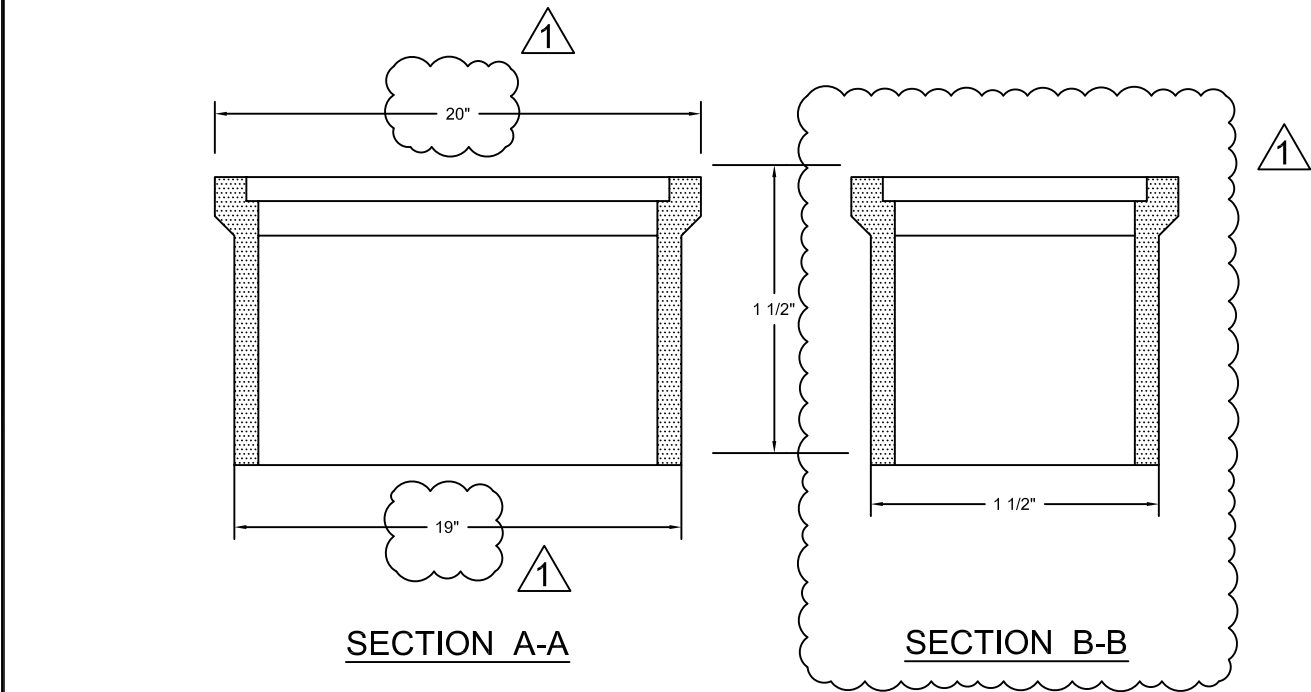
DRAWING NUMBER

W14

Friday, May 27, 2011




- GENERAL NOTES:
1. MATERIAL SHALL BE CONCRETE/POLYMER.
  2. CASTING TO BE SMOOTH AND VOID OF AIR HOLES.
  3. ACCEPTABLE MANUFACTURERS ARE AS FOLLOWS:  
BROOKS MODEL 37 MB  
ARMORCAST MODEL P6000485, A6000485 OR A600048SSA  
CARSON LLC MSBCF11 18-12XL  
NEW BASIS WFB1220122 AOC OR APPROVED EQUAL
  4. DIMENSIONS SHOWN ARE APPROXIMATE. FINAL DIMENSIONS SHALL BE BASED ON SELECTED MFR.
  5. THIS DETAIL IS FOR 1-INCH WATER METERS. FOR ALL OTHER WATER METER SIZES REFER TO THE PSUS POTABLE WATER MATERIALS GUIDELINE.
  6. BOX SHALL BE RATED FOR H20 LOADING.



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: 1" WATER METER BOX (TRAFFIC)



PALMETTO STATE UTILITY SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	ADDED SECTION B-B; GENERALIZED DIM.	SFM	3-16-09	

SCALE: NTS

DRAWING NUMBER W5

Friday, May 27, 2011

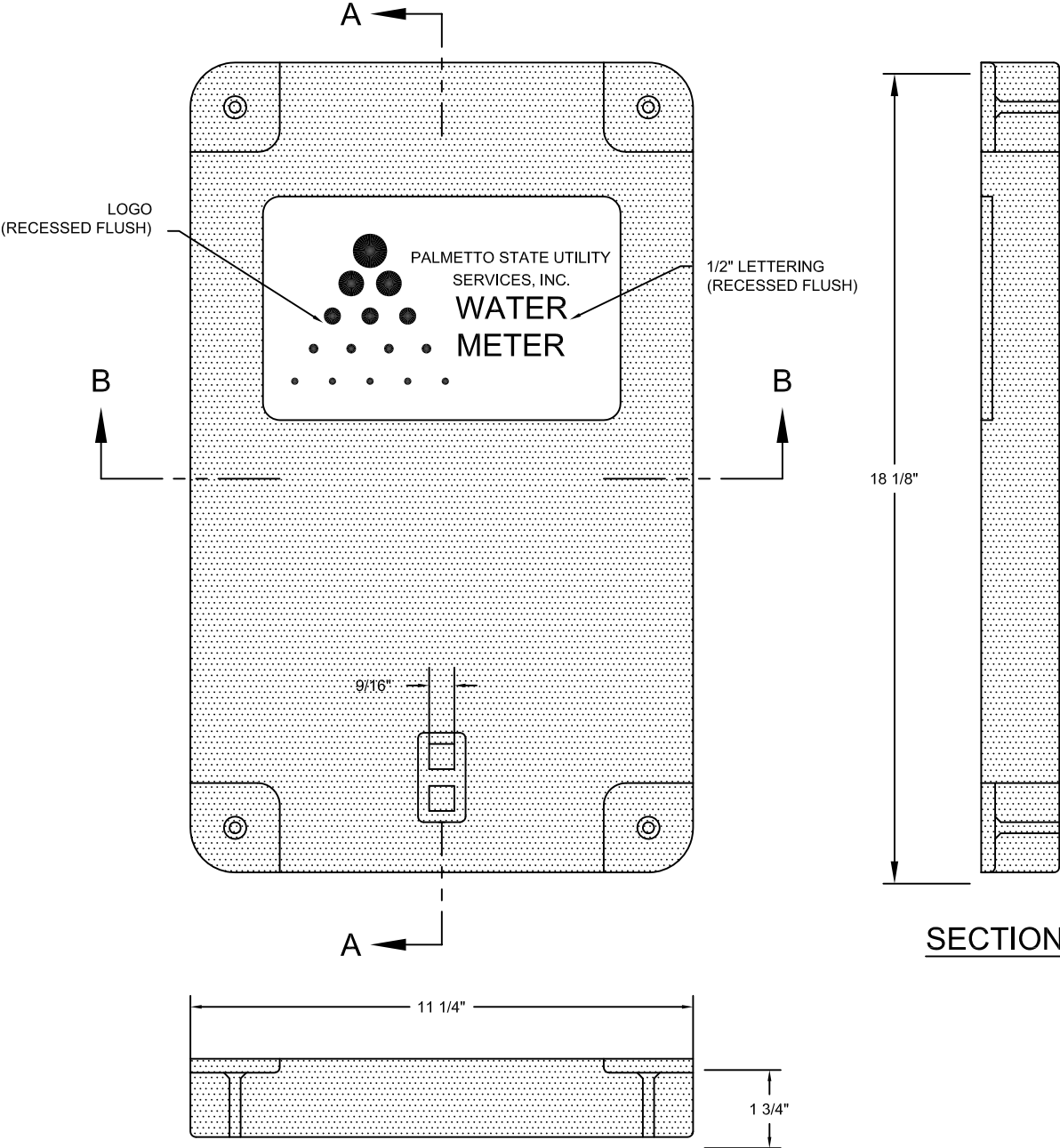
1. COVER AND LID SHALL BE POLYMER CONCRETE.

2. CASTING TO BE SMOOTH, AND VOID OF AIR HOLES.

3. METER LIDS AND COVERS SHALL BE AS FOLLOWS:  
CARSON LLC MSBCF1118SPCPD COVER  
MSCBC101 DROP IN LID.  
NEW BASIS WPC1220B12A0A00 DROP IN COVER  
WPC0509A02A0BWM DROP IN LID  
ARMORCAST A6000484DQ DROP IN COVER  
A6000487 DROP IN LID  
A60000484 1 PC COVER  
A6000484 1 PC COVER  
BOOK 375 - LID AND COVER
4. DIMENSIONS SHOWN ARE APPROXIMATE. FINAL DIMENSIONS SHALL BE BASED ON MFR SELECTED.

5. THIS DETAIL IS FOR 1-INCH WATER METERS. FOR ALL OTHER WATER METER SIZES REFER TO THE PALMETTO STATE UTILITY SERVICES POTABLE WATER MATERIALS GUIDELINE.

6. COVER SHALL BE RATED FOR H20 LOADING.

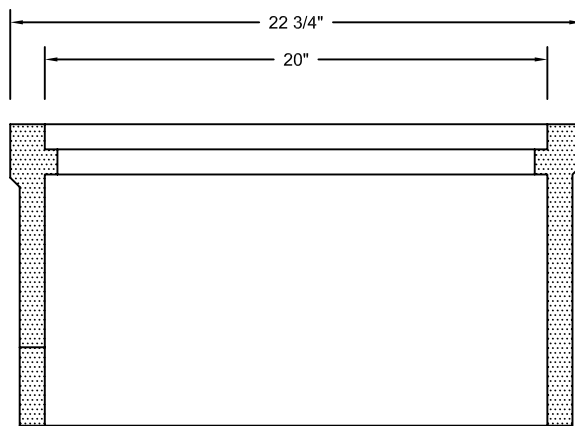
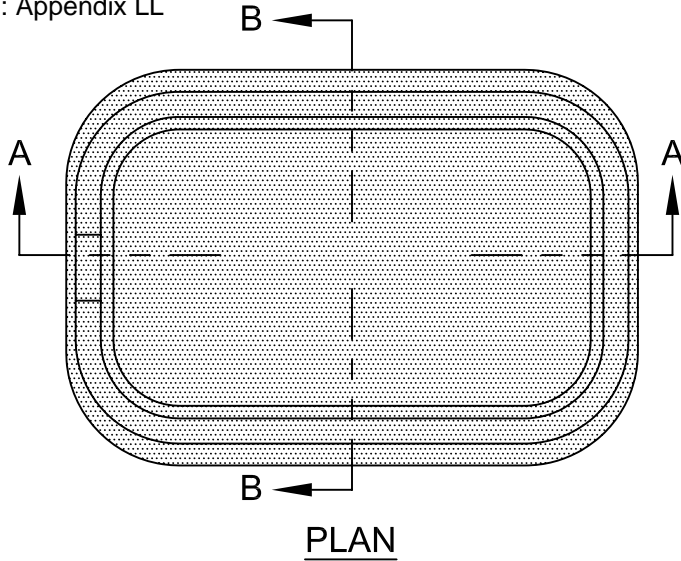
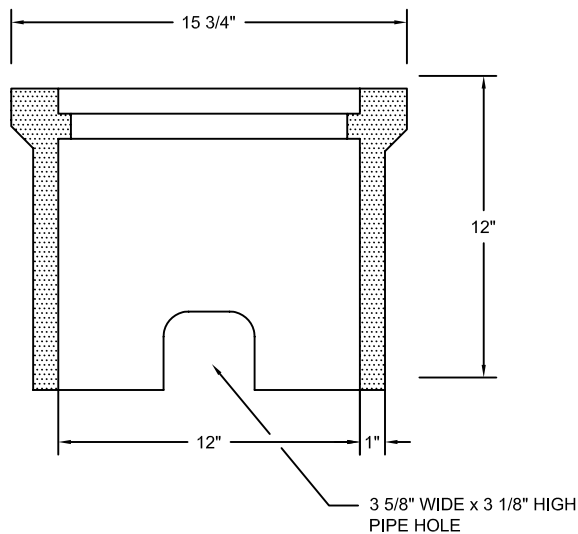


SECTION A-A

SECTION B-B

**GENERAL NOTES:**

1. MATERIAL SHALL BE CONCRETE/POLYMER.
2. CASTING TO BE SMOOTH AND VOID OF AIR HOLES.
3. ACCEPTABLE MANUFACTURERS ARE AS FOLLOWS:  
BROOKS MODEL 37 MB  
ARMORCAST MODEL P6000485, A6000485 OR A600048SSA  
CARSON LLC MSBCF11 18-12XL  
NEW BASIS WFB1220122 AOC OR APPROVED EQUAL
4. DIMENSIONS SHOWN ARE APPROXIMATE. FINAL DIMENSIONS SHALL BE BASED ON SELECTED MFR.
5. THIS DETAIL IS FOR 1-INCH WATER METERS. FOR ALL OTHER WATER METER SIZES REFER TO THE PALMETTO STATE UTILITY SERVICES POTABLE WATER MATERIALS GUIDELINE.

**SECTION A-A**

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: **1" WATER METER BOX (NON-TRAFFIC)**

**PALMETTO STATE UTILITY  
SERVICES, INC.**

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

## REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REVISED SHEET NUMBER	SFM	3-16-09	

SCALE:

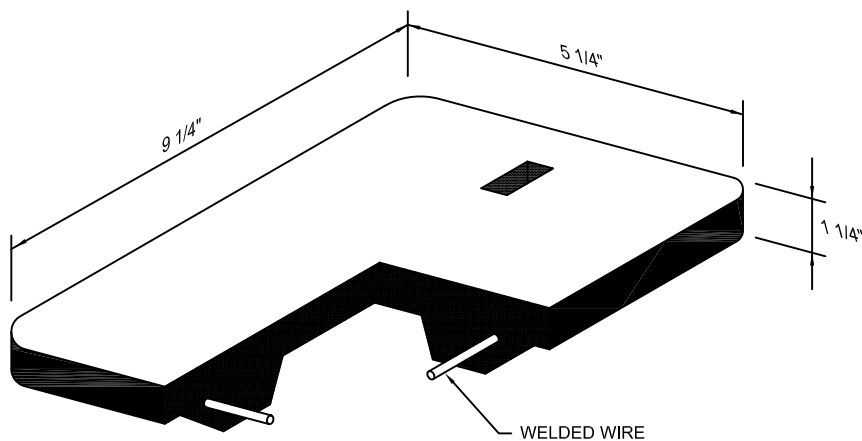
**NTS**

Friday, May 27, 2011

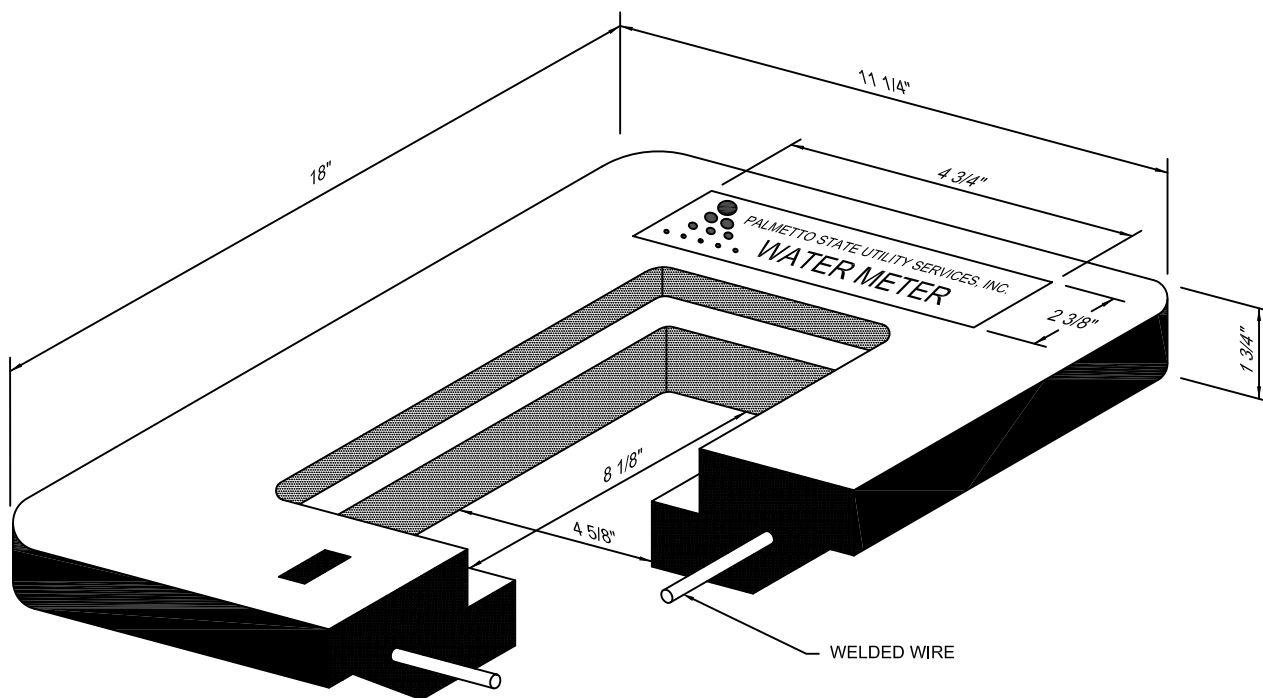
**W7**

GENERAL NOTES:

- |    |  |     |  |
|----|--|-----|--|
| 1. | METER BOX COVER AND LID SHALL BE POLYMER CONCRETE.   | 4.  | DIMENSIONS SHOWN ARE APPROXIMATE. FINAL DIMENSIONS SHALL BE BASED ON MFR SELECTED.   |
| 2. | CASTING TO BE SMOOTH, AND VOID OF AIR HOLES.   | 5.. | THIS DETAIL IS FOR 1-INCH WATER METERS. FOR ALL OTHER WATER METER SIZES REFER TO THE PSUS POTABLE WATER MATERIALS GUIDELINE. |
| 3. | METER LIDS AND COVERS SHALL BE AS FOLLOWS:<br>CARSON LLC MSBCF1118SPCPD COVER<br>MSCBC101 DROP IN LID.<br>NEW BASIS WPC1220B12A0A00 DROP IN COVER<br>WPC0509A02A0BWM DROP IN LID<br>ARMORCAST A6000484DQ DROP IN COVER<br>A6000487 DROP IN LID<br>A60000484 1 PC COVER<br>A6000484 1 PC COVER<br>BOOKS 375 - LID AND COVER |     |  |



**LID**



COVER

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: 1" WATER METER COVER (NON-TRAFFIC)

PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	Frid
	1	REVISED SHEET NUMBER	SFM	3-16-09	

SCALE:

NTS

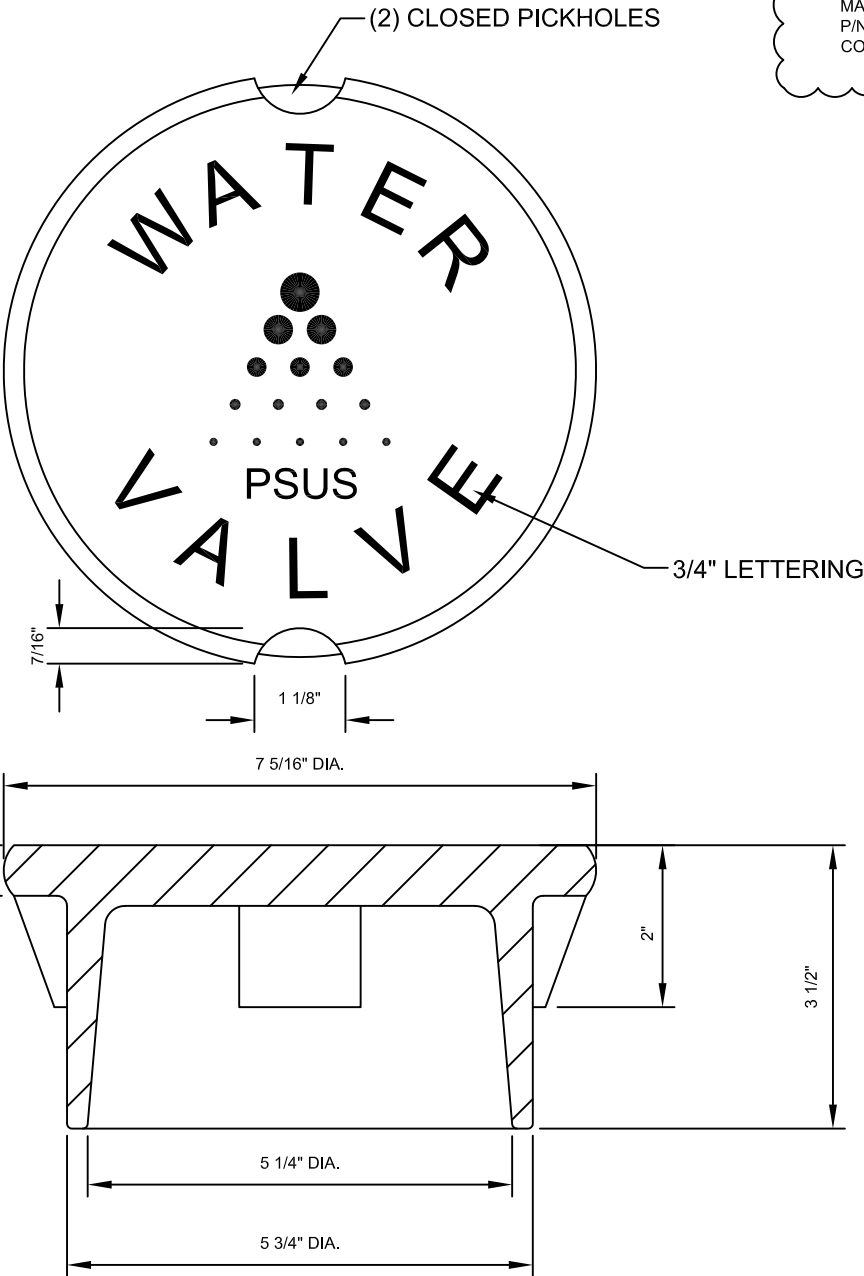
Friday, May 27, 2011

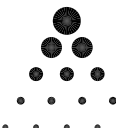
W8

GENERAL NOTES:

1. MATCHING SURFACES MARKED "MF" TO BE FINISHED OF ANY IRREGULARITIES THAT WOULD PREVENT A SNUG FIT.
2. CASTING TO BE SMOOTH AND VOID OF AIR HOLES.

3. ORDER AS FOLLOWS:  
MANUFACTURER: BINGHAM & TAYLOR CO.  
P/N: CUL5LPVPSUD  
CONTACT: BILL THOMAS (336) 283-8891 (P)  
(336) 283-4309 (F)



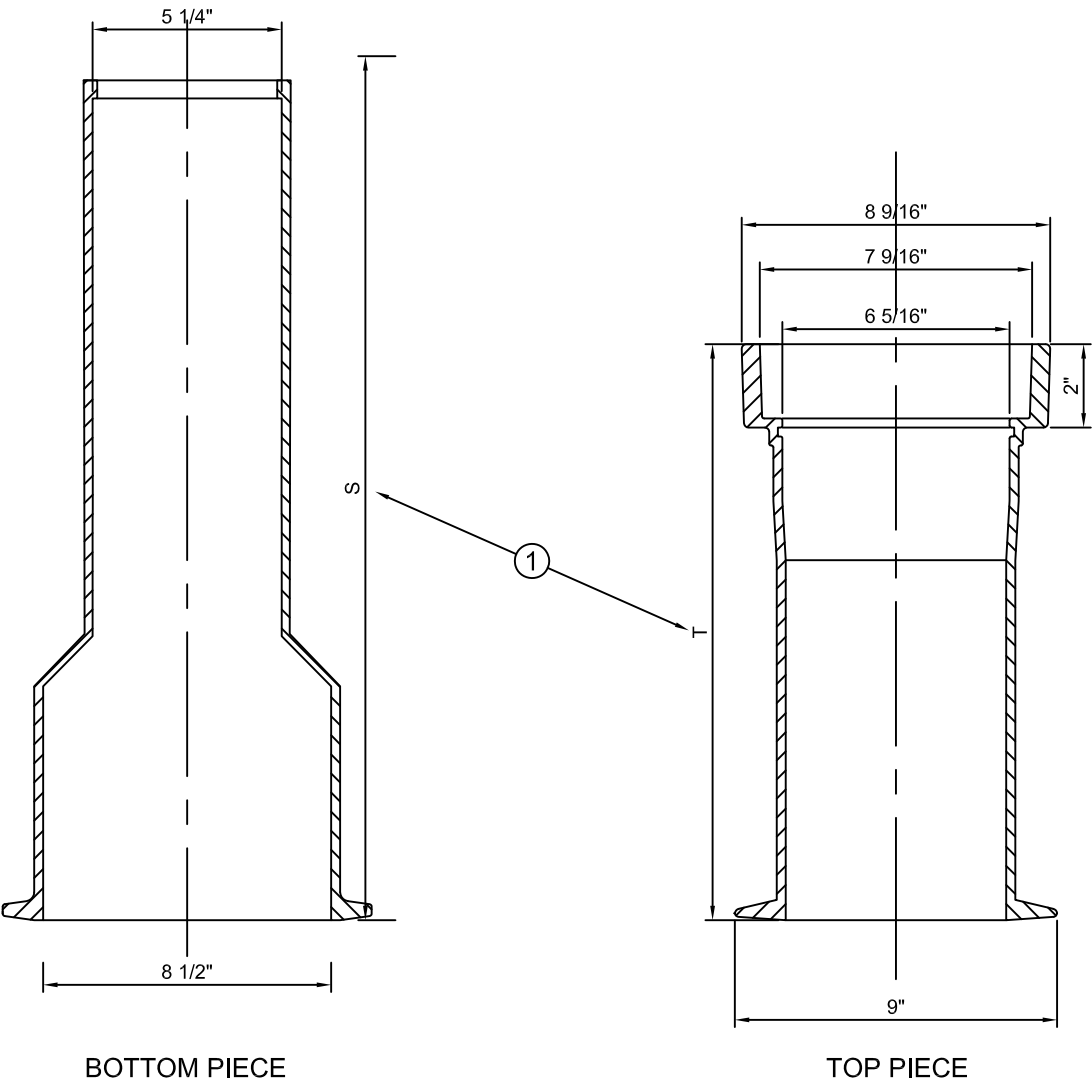
STANDARD CONSTRUCTION DRAWING - FORT JACKSON				TITLE: VALVE BOX COVER			
 <div><b>PALMETTO STATE UTILITY SERVICES, INC.</b> A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054</div>	REVISIONS						SCALE: <b>NTS</b>
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
			ORIGINAL ISSUE DATE		6-11-08		DRAWING NUMBER <b>W012HP-11-R-0005</b>
		1	INCLUDES OREDER INFORMATION	SFM	3-16-09		

GENERAL NOTES:

1. MATERIAL IS GRAY IRON CASTING. CASTING TO BE SMOOTH AND VOID OF AIR HOLES.
2. VALVE BOXES SHALL BE BINGHAM & TAYLOR CAST IRON 5-1/4" 2-PIECE SLIDING TYPE OR APPROVED EQUAL

KEY NOTES:

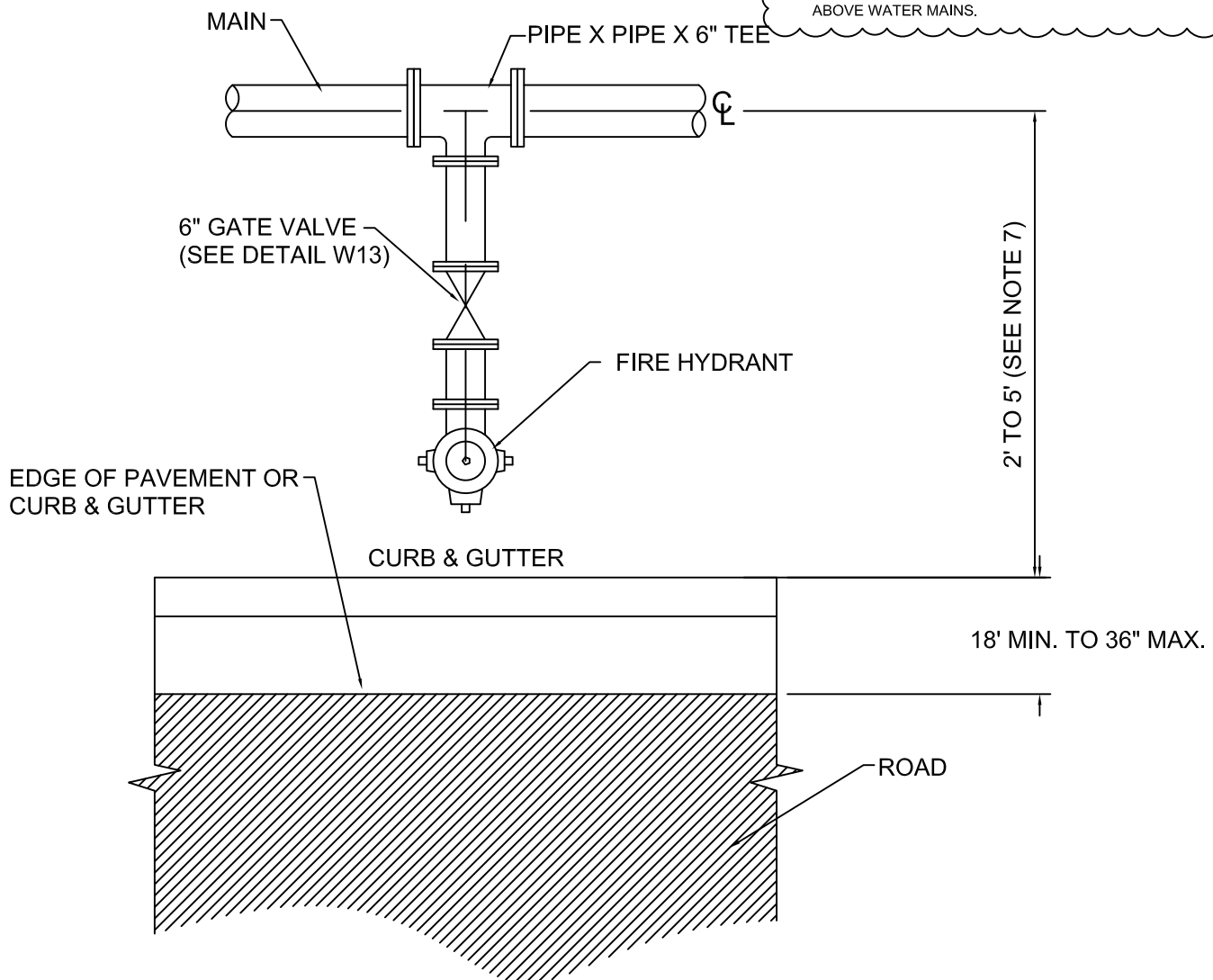
1. DIMENSIONS "S" AND "T" VARY WITH DEPTH AND PART NUMBER ORDERED.





GENERAL NOTES:

1. FOR INSTALLATION OF FIRE HYDRANT SEE DETAIL W12.
2. ALL FIRE HYDRANTS SHALL BE MUELLER SUPER CENTURION A423 5 1/4" MAIN VALVE WITH MEGALUG FLANGES.
3. FIRE HYDRANT SHALL BE INSTALLED WITH THE 4 1/2" STEAMER CONNECTION FACING THE STREET.
4. NO OBSTRUCTION SHALL BE PERMITTED WITHIN A 6 FT. RADIUS OF THE FIRE HYDRANT. FIRE HYDRANT SHALL NOT BE PLACED IN A WHEEL CHAIR RAMPS, DRIVEWAYS BETWEEN HOUSES OR IN YARDS AND SHALL BE SPACED PER FORT JACKSON FIRE DEPARTMENT .
5. FIRE HYDRANTS SHALL BE INSTALLED AND LOCATED AT THE ENTRY OF THE HOUSING AREAS, INTERSECTIONS AND CUL-DE-SACS.
6. A LICENSED OR CERTIFIED CONTRACTOR SHALL INSTALL THE NEW FIRE HYDRANTS. NO BOLLARDS WILL BE INSTALLED AROUND THE FIRE HYDRANTS.
7. DISTANCE BETWEEN WATER MAIN AND FIRE HYDRANT MAY VARY WITH APPROVAL OF PSUS.
8. NO SIDEWALK OR STRUCTURE SHALL BE CONSTRUCTED ABOVE WATER MAINS.



# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## FIRE HYDRANT LOCATIONS

PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essavons Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	DEL. CASE 2; DEL. SIDEWALK; REV./ADD NOTES	SFM	3-16-09	Er

SCAI F.

NTS

DRAWING NUMBER

Friday, May 27, 2011

KEY NOTES:

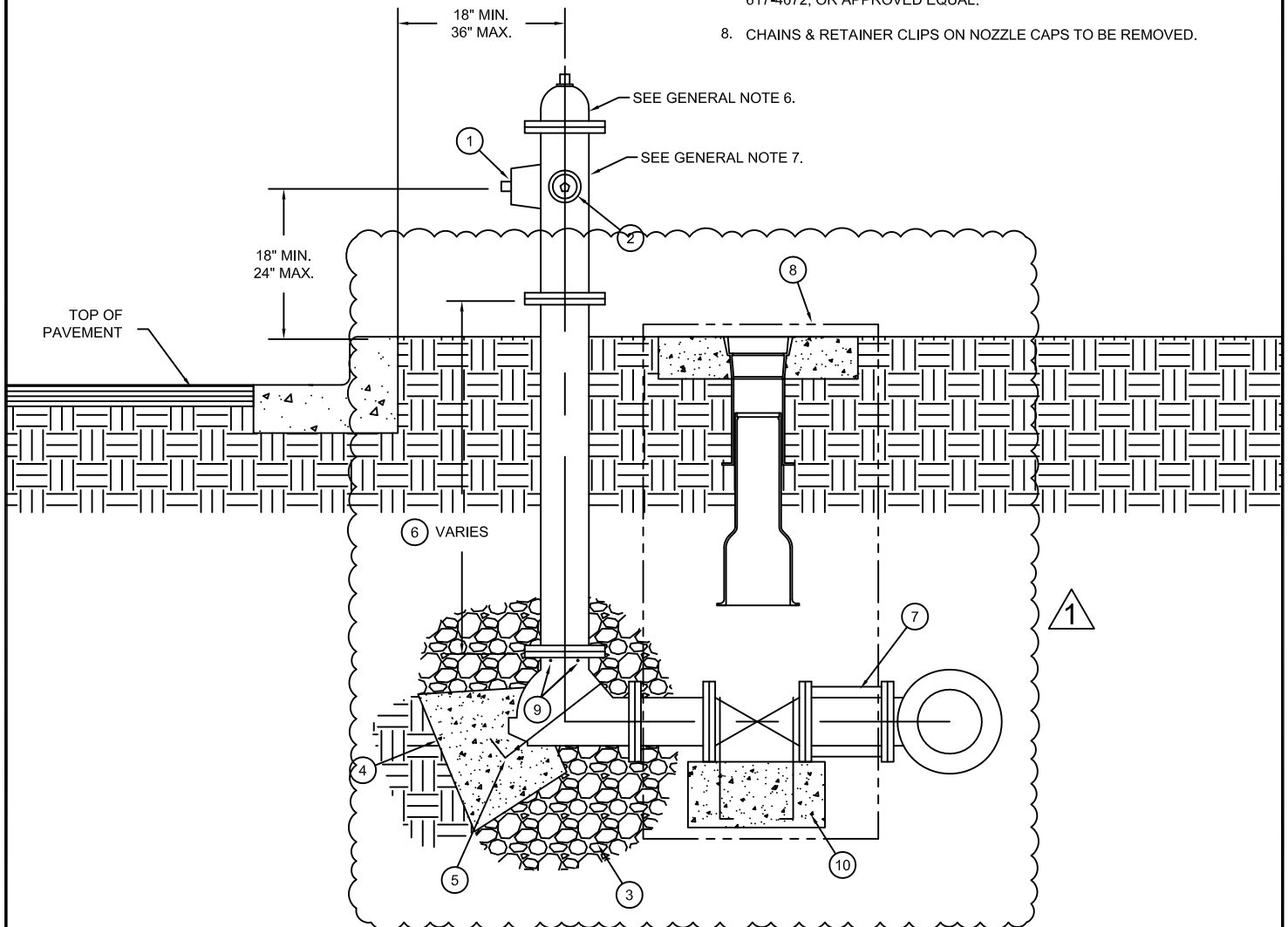
- 1 PUMPER NOZZLE 4 1/2" TO BE FACING THE TRAVELED WAY, UNLESS OTHERWISE NOTED IN THE PLANS.
- 2 HOSE NOZZLE 2 1/2" - 2 EACH.
- 3 DRAIN PIT 3/8" PEA GRAVEL PLACE TO ABOVE F.H. SHOE TO ALLOW FOR WEEP HOLE DRAINAGE.
- 4 CONC. THRUST BLOCK, APPROX. 2'x2'x3' TO BE POURED AGAINST UNDISTURBED EARTH, F.H. **WEEP HOLE MUST BE UNOBSTRUCTED.**
- 5 NO. 5 REBAR HAIRPINS.
- 6 CONTRACTOR IS TO PROVIDE ADDITIONAL SPOOLS IF NEEDED TO MAINTAIN THE 18" MIN. TO 24" MAX. DISTANCE BETWEEN THE GROUND ELEVATION AND THE 4 1/2" PUMPER NOZZLE.
- 7 MINIMUM OF (4) 3/4" BITUMINOUS COATED TIE RODS. A VALVE AND HYDRANT TEE MAY BE USED IN LIEU OF TIE RODS.
- 8 SEE GATE VALVE DETAIL W13.
- 9 WEEP HOLES
- 10 ANCHOR BLOCK AND HAIRPINS - SEE DRAWING W33

GENERAL NOTES:

1. ALL FIRE HYDRANTS SHALL BE MUELLER SUPER CENTURION A423 5 1/4" MAIN VALVE WITH MEGALUG FLANGES.
2. FIRE HYDRANT SHALL BE INSTALLED WITH THE 4 1/2" STREAMER CONNECTION FACING THE STREET.
3. NO OBSTRUCTION SHALL BE PERMITTED WITHIN A 6 FT. RADIUS OF THE FIRE HYDRANT. FIRE HYDRANT **SHALL NOT BE PLACED IN A WHEEL CHAIR RAMPS, DRIVEWAYS, BETWEEN HOUSES OR IN YARDS AND SHALL BE SPACED PER PORT JACKSON DIRECTORATE OF EMERGENCY SERVICES REQUIREMENTS.**
4. FIRE HYDRANTS SHALL BE INSTALLED AND LOCATED AT THE ENTRY OF THE HOUSING AREAS, INTERSECTIONS AND CUL-DE-SACS.
5. BOLLARDS MAY BE INSTALLED ON A CASE BY CASE BASIS.
6. THE FIRE HYDRANT'S BONNET & BELL SHALL BE PAINTED AS FOLLOWS:

CLASS AA	LIGHT BLUE	GREATER THAN 1,500 GPM
CLASS A	GREEN	1,000-1,499 GPM
CLASS B	ORANGE	500-999 GPM
CLASS C	RED	LESS THAN 500 GPM

(ALL ABOVE TO INCLUDE REFLECTIVE MATERIAL)
7. THE FIRE HYDRANT'S BODY SHALL BE PAINTED SAFETY / CHROME YELLOW SHERWIN WILLIAMS - INDUSTRIAL & MARINE COATINGS, INDUSTRIAL ENAMEL "ALKYD COATING", NUMBER B54 Y 37 / 617-4072, OR APPROVED EQUAL.
8. CHAINS & RETAINER CLIPS ON NOZZLE CAPS TO BE REMOVED.



# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## FIRE HYDRANT INSTALLATION

PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

## REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REV. CONFIG.; ADD THRUST BLOCK; REV. NOTES	SFM	3-16-09	
					Er

SCALE:

NTS

DRAWING NUMBER

Friday, May 27, 2011

GENERAL NOTES:

1.

VALVE SHALL BE DUCTILE IRON AND ENDS SHALL BE MECHANICAL TYPE.
2.

ALL BURIED VALVES SHALL BE PROVIDED WITH SOLID STEEL EXTENSION STEM OPERATOR WITH 2" SQUARE AWWA NUT WITHIN 36" OF VALVE BOX COVER. NUT IS TO INDICATE DIRECTION OF ROTATION TO OPEN VALVE.
3.

IF STANDARD VALVE BOX IS NOT LONG ENOUGH TO COVER THE VALVE STEM, CONTRACTOR SHALL PROVIDE A 6" DIAMETER PIPE BETWEEN THE BOTTOM PIECE OF THE VALVE BOX AND THE GATE VALVE.
4.

GATE VALVES WILL BE LOCATED AT INTERSECTIONS AS SHOWN AND SHALL NOT BE MORE THAN 500' APART.

KEY NOTES:

- 1

CLEAN VALVE BOX OF ALL DEBRIS AND SOIL.
- 2

COAT BURIED PIPE AND VALVE BOX W/COAL TAR EPOXY, VALVE SHALL BE WRAPPED IN POLYETHYLENE PLASTIC. GATE VALVE SHALL BE A RESILIENT SEAT MUELLER A-2361 W/AQUAGRIP SYSTEM OR APPROVED EQUAL.
- 3

3000 PSI CONCRETE VALVE SUPPORT (SEE TABLE BELOW) AND (2) #5 REBAR HAIRPINS. PAINT UNEMBEDDED PORTION WITH 2 COATS OF COAL TAR EPOXY.
- 4

STANDARD VALVE BOX COVER. SEE DETAIL W5.
- 5

MINIMUM 2 1/2" CONCRETE OR BRICKS ALL AROUND.
- 6

3000 PSI CONCRETE (SEE TABLE BELOW) 6" THICK BY 3" TO 4" IN DIAMETER FOR PAVED AREAS WITH STANDARD BASE COURSE MATERIAL, MAKE FLUSH WITH JMAC. FOR UNPAVED AREAS, TAPER EDGE AND RAISE 2" ABOVE ADJACENT GROUND SURFACE.
- 7

12" CEMENT STABILIZED BACKFILL IN PAVED AREAS.
- 8

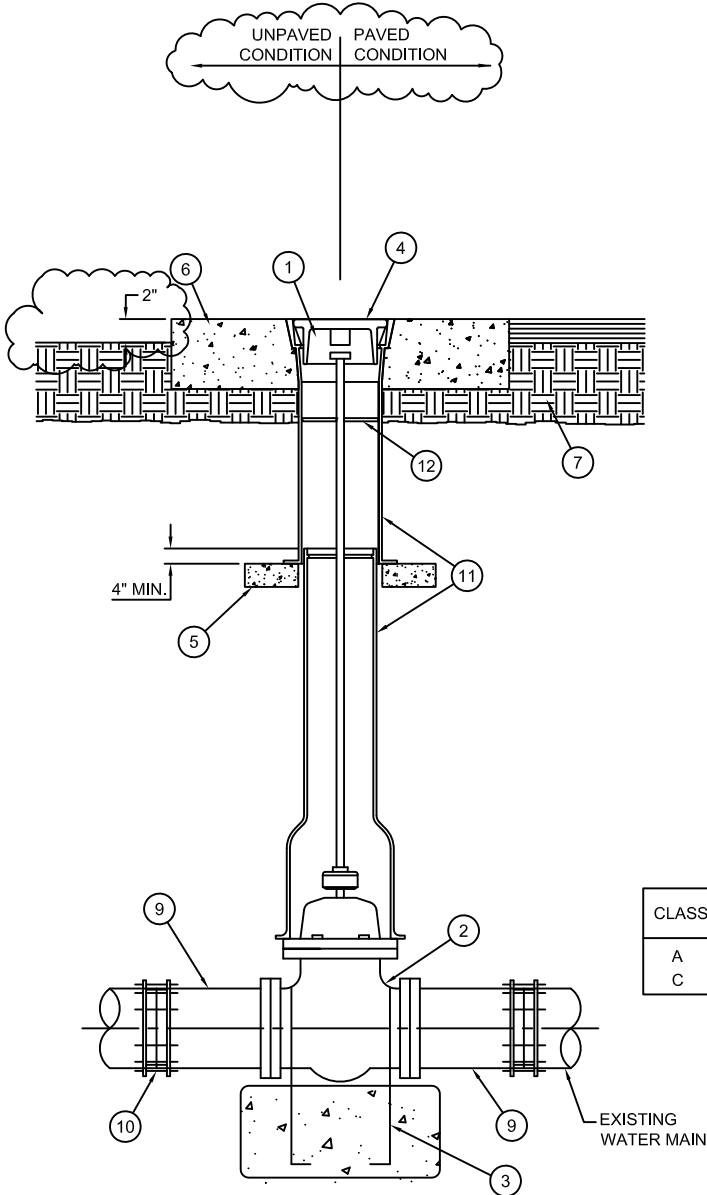
NOT USED.
- 9

PROVIDE SPOOL PIECE AS REQUIRED.
- 10

SOLID SLEEVE AS REQUIRED.
- 11

STANDARD VALVE BOX. SEE DETAIL W6.
- 12

1/4" THICK STEEL TRASH RING. OD IS 1/8" SMALLER THAN ID OF VALVE BOX.



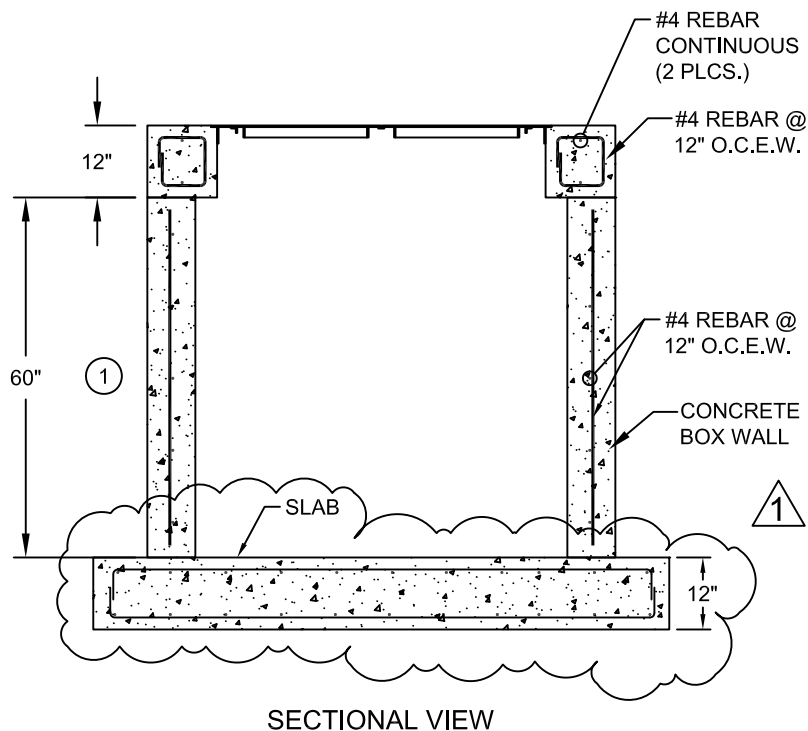
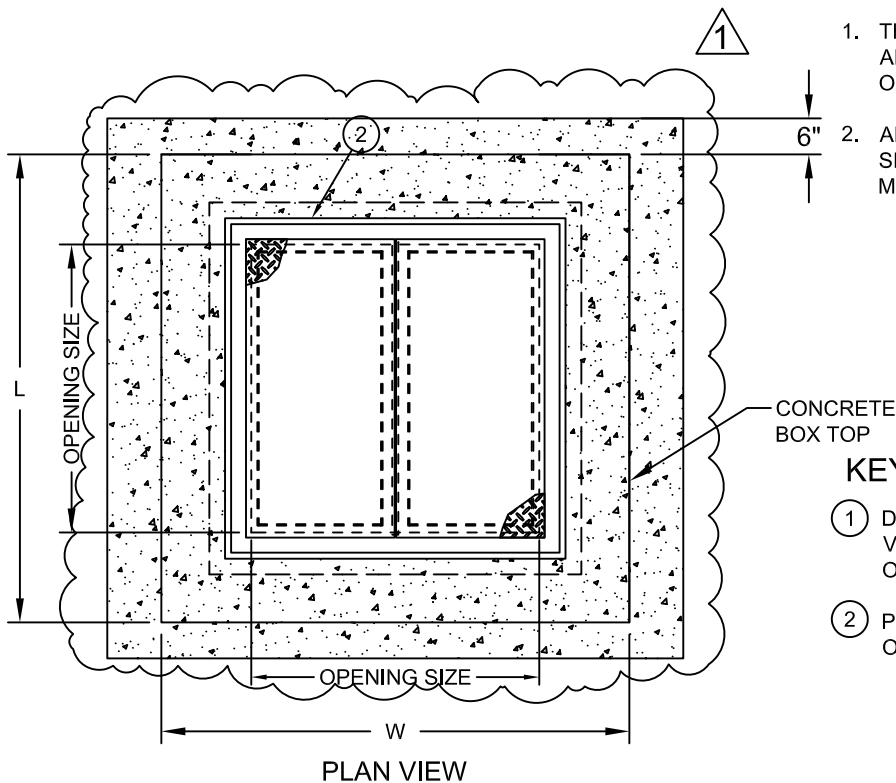
GENERAL NOTES:

1. THE PRE-CAST CONCRETE SHALL HAVE A MINIMUM ALLOWABLE COMPRESSIVE STRENGTH AT 28 DAYS OF 4000 PSI FOR THE TOP, WALLS AND FOOTINGS.
2. ALL JOINTS SHALL HAVE FLEXIBLE BUTYL RUBBER SEALANT. SEALANT SHALL CONFORM TO AASHTO M-198 AND FEDERAL SPECIFICATION SS-S-210A.

### KEY NOTES:

- ① DIMENSION ON THE HEIGHT OF THE BOX MAY VARY TO FIT EXISTING CONDITIONS. MUST HAVE OWNER'S APPROVAL.
- ② PRODUCT SHALL BE BILCO MODEL KD-2 OR KD-3 OR APPROVED EQUAL. SEE TABLE BELOW.

2			
W	L	BILCO MODEL #	OPENING SIZE
6'-6"	6'-6"	KD-2	48" X 48"
6'-6"	7'-6"	KD-2	48" X 48"
6'-6"	8'-6"	KD-3	48" X 72"
6'-6"	9'-6"	KD-3	48" X 72"
6'-6"	10'-6"	KD-3	48" X 72"



# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

CONCRETE BOXES W/ BILCO HATCH

PALMETTO STATE UTILITY  
SERVICES, INC.

A Subsidiary of American States Utility Services, Inc.

• Building 2576, Essarys Way Fort Jackson, SC 29207

Tel: (803) 790-7288 Fax: (803) 787-2054

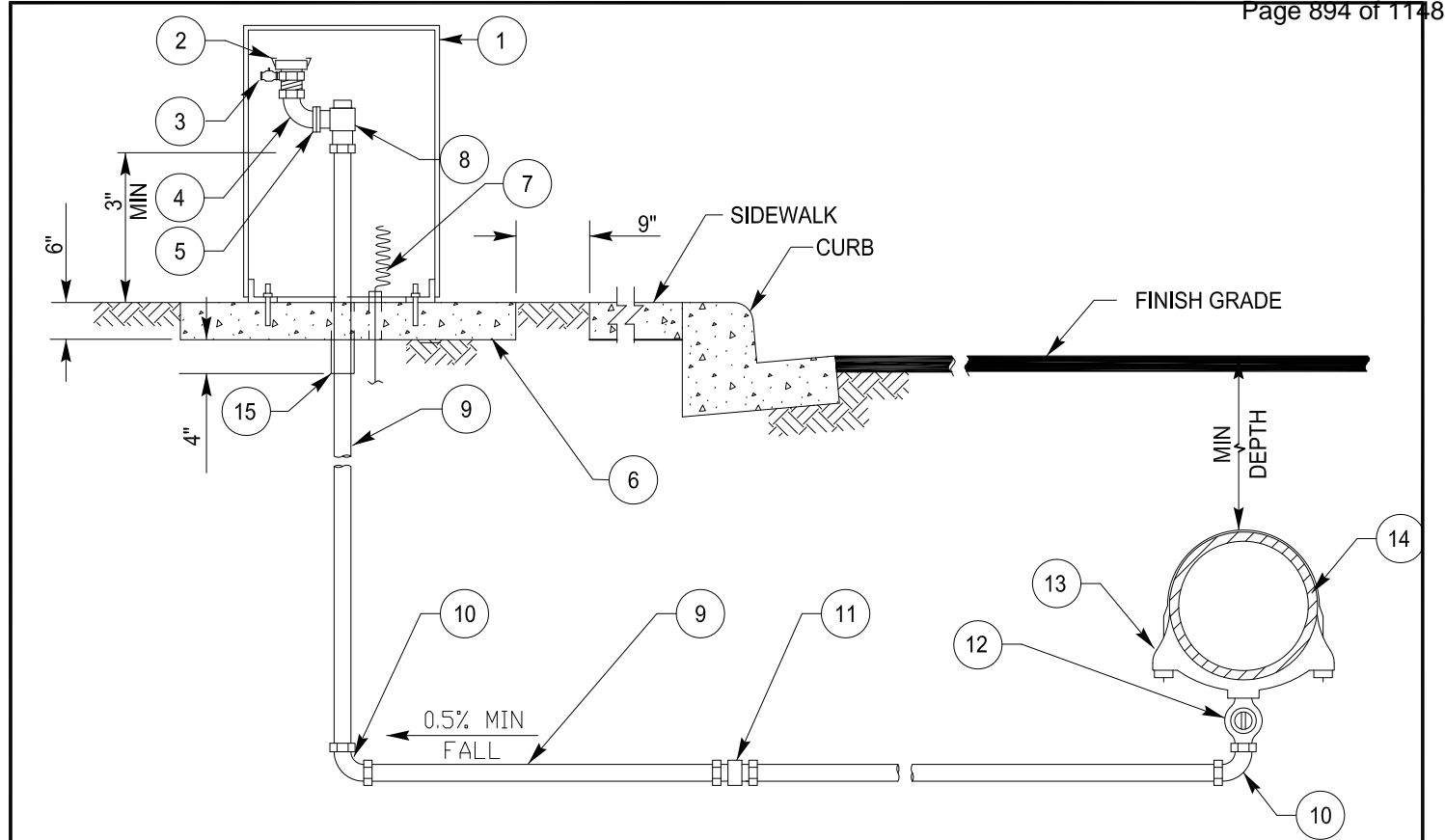
REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	REVISED TO PROVIDE SLAB	SFM	3-16-09	
					Er

SCALF.

NTS

DRAWING NUMBER

Friday, May 27, 2011



- NOTES:
- 1) VALVE ENCLOSURE SHALL BE INSTALLED PER MANUFACTURER SPECIFICATIONS.
  - 2) MINIMUM DEPTH TO PIPE IS AS SHOWN ON DRAWING W4.
  - 3) INSTALL WARNING/IDENTIFICATION TAPE ABOVE ALL PIPING
  - 4) CAM & GROOVE FITTING ADAPTER SHALL BE DRILLED AND TAPPED AS REQUIRED FOR THE PRESSURE PET COCK
  - 5) MATERIALS SHALL BE SELECTED FROM THE APPROVED MATERIALS LIST

1

ITEM NO	SIZE AND DESCRIPTION	ITEM NO	SIZE AND DESCRIPTION
1	VALVE ENCLOSURE	8	2" BRONZE COMP x FLG ANGLE METER STOP WITH LOCK WING
2	2" CAM & GROOVE FITTING ADAPTER x MIPT WITH LOCKING DUST CAP, SEE NOTE 8	9	2" x REQUIRED LENGTH COPPER PIPE TYPE "K" RIGID OR SOFT
3	□" PRESSURE PET COCK	10	2" 90° BRONZE COMPRESSION ELL
4	2" 90° BRONZE MIPT x FIPT ELL	11	2" BRONZE COMPRESSION COUPLING COPPER TO COPPER (IF REQUIRED)
5	2" OVAL METER FLANGE FLG x FIPT, WITH GASKET	12	2" BRONZE MIPT x COMP CORP. STOP
6	30" X 30" X 6" CONCRETE SLAB	13	SIZE x 2" SERVICE SADDLE
7	TRACER WIRE (AS REQUIRED)	14	WATER MAIN
		15	2" x □" BLACK FOAM SLEEVE

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: BLOWOFF ASSEMBLY

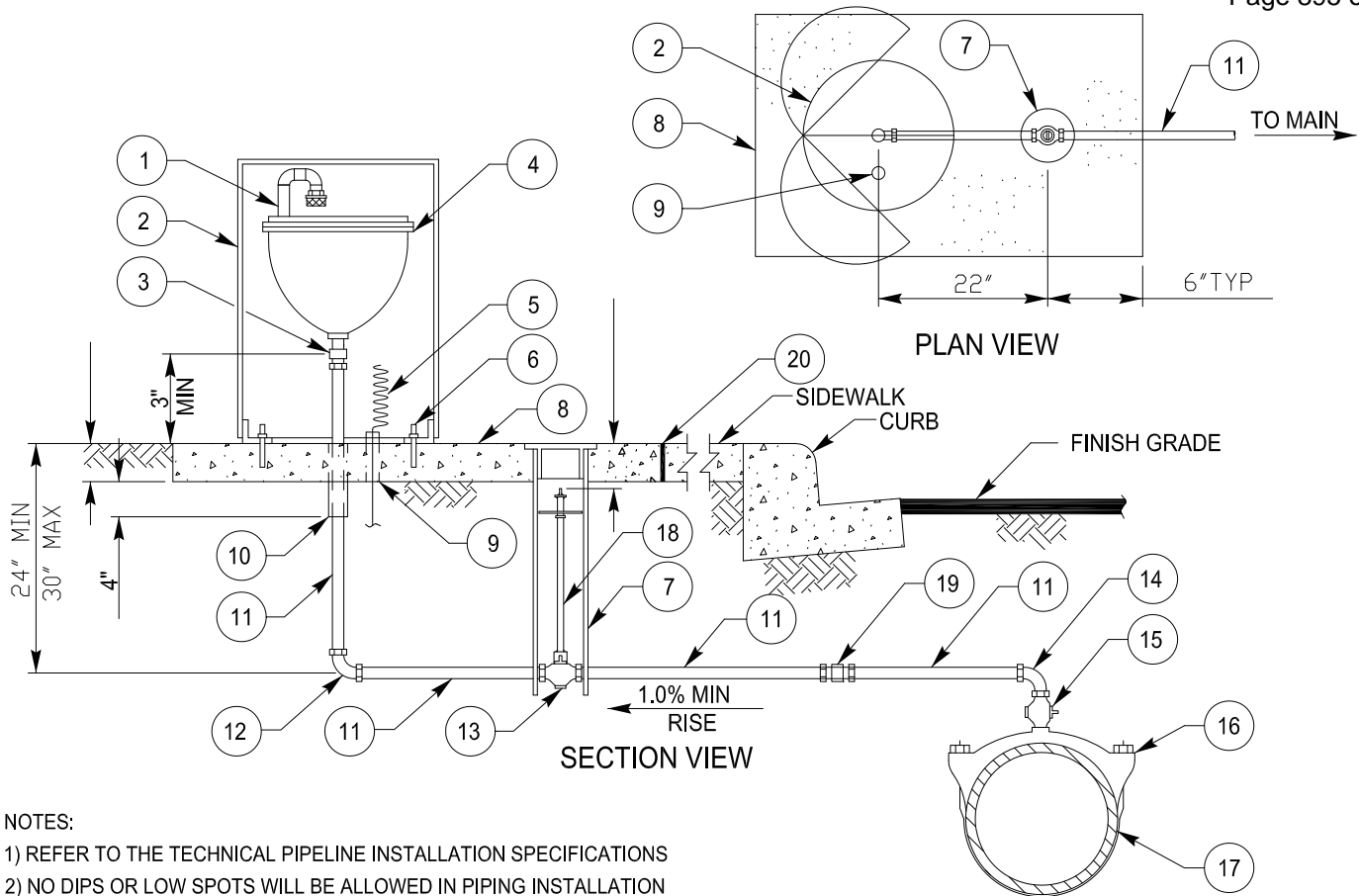
**PALMETTO STATE UTILITY SERVICES, INC.**  
A Subsidiary of American States Utility Services, Inc.  
Building 2576, Essayons Way Fort Jackson, SC 29207  
Tel: (803) 790-7288 Fax: (803) 787-2054

REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NEW ABOVEGROUND BLOWOFF DETAIL	SFM	3-16-09	

SCALE:  
**NTS**

DRAWING NUMBER  
**W15**

Friday, May 27, 2011



NOTES:

- 1) REFER TO THE TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS
- 2) NO DIPS OR LOW SPOTS WILL BE ALLOWED IN PIPING INSTALLATION
- 3) LOCATE ENCLOSURE AS SHOWN ON W17
- 4) INSTALL TRACER WIRE AND WARNING/IDENTIFICATION TAPE ABOVE ALL HORIZONTAL PIPING
- 5) NOTCH BASE OF GATE WELL TO CENTER OVER VALVE. SET LID FLUSH WITH SLAB.
- 6) MATERIALS SHALL BE SELECTED FROM THE APPROVED MATERIALS LIST

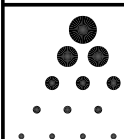


ITEM NO	SIZE AND DESCRIPTION	ITEM NO	SIZE AND DESCRIPTION
1	2" PVC SCH 80 CLOSE NIPPLE & 2-SCH 80 STREET ELLS & SUCTION SCREEN	10	2" x 1/2" BLACK FOAM SLEEVE
2	FREEZE PROOF ALL WEATHER ENCLOSURE	11	2" x REQUIRED LENGTH RIGID COPPER PIPE
3	2" MIPT x COMPRESSION ADAPTER	12	2" 90 DEG. BRONZE COMPRESSION ELL
4	2" AUTOMATIC COMBINATION AIR RELEASE & AIR/VACUUM VALVE	13	2" COMP BALL VALVE W/ TEE HEAD
5	TRACER WIRE (IF REQUIRED)	14	2" 90 DEG. BRONZE FIPT x COMP ELL
6	1/2" x 3" STAINLESS STEEL DROP-IN ANCHORS (3 EA @ 120" APART)	15	2" BRONZE MIPT x MIPT CORPORATION STOP
7	BOX WITH GATE VALVE PER DRAWING W9	16	SIZE x 50mm 2" SERVICE SADDLE
8	1050mm x 750mm x 150mm THICK (42"x 30"x 6" THICK) CONCRETE SLAB	17	WATER MAIN
9	25mm (1") PVC CONDUIT FOR TRACER WIRE INSTALLED 50mm (2") ABOVE SLAB	18	VALVE STEM EXTENSION,(REQ'D)
		19	2" BRONZE COMPRESSION COUPLING (IF REQUIRED)
		20	COLD JOINT STRIP

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

2" AIR RELEASE VALVE

PALMETTO STATE UTILITY  
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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NEW ABOVEGROUND AIR RELEASE DETAIL	SFM	3-16-09	Er

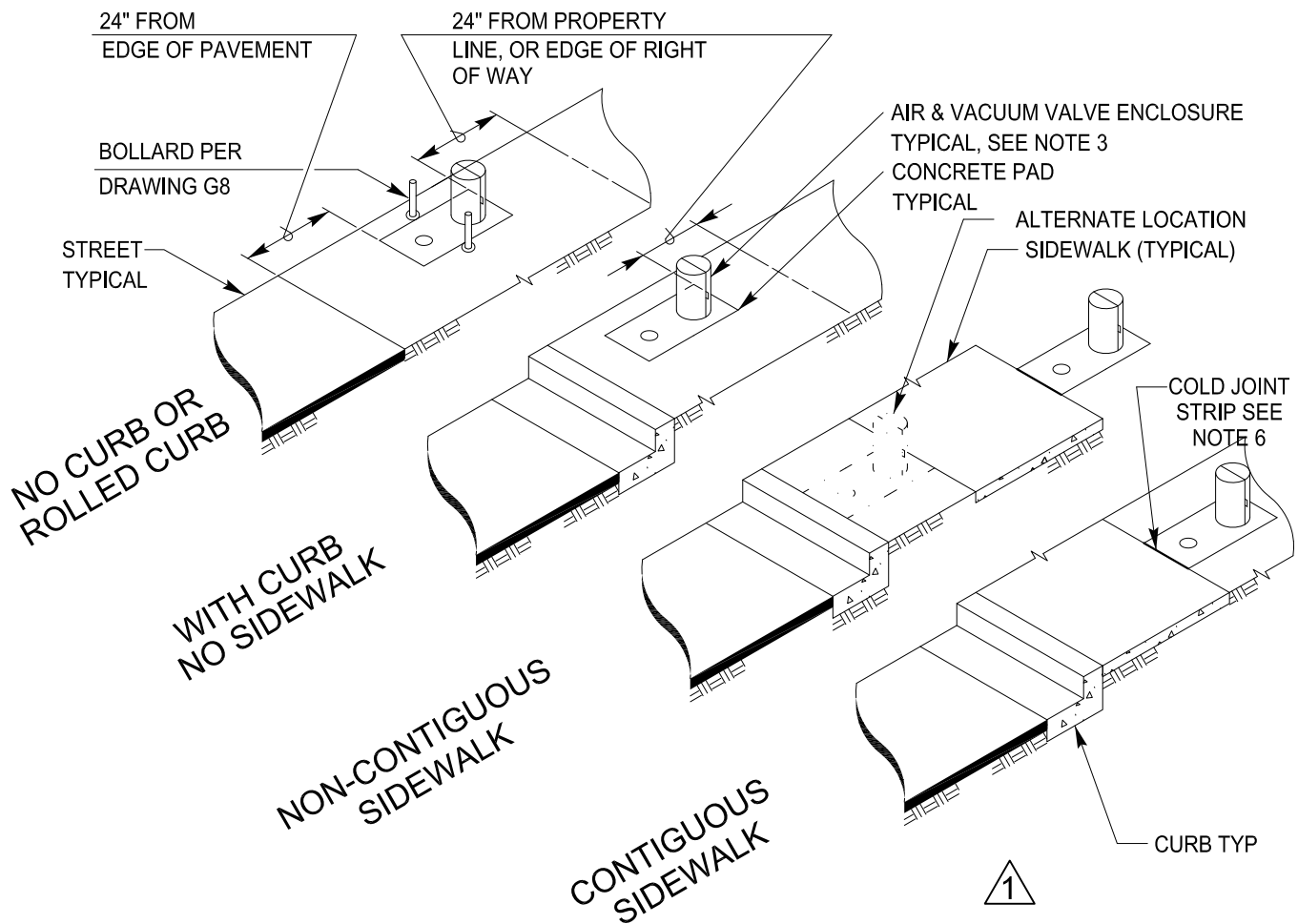
SCAI F.

NTS

DRAWING NUMBER

Friday, May 27 W16

Friday, May 27, 2011



NOTES:

- 1) REFER TO TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS
- 2) BOLLARDS SHALL BE INSTALLED AS CALLED FOR ON THE PLANS OR AS DIRECTED BY PSUS
- 3) AN EASEMENT MAY BE NEEDED DEPENDING ON LOCATION OF ENCLOSURE
- 4) THE ENCLOSURE SHALL BE ARMY BROWN
- 5) IF THE CONCRETE SLAB IS TO BE INSTALLED ADJACENT TO A CONCRETE SIDEWALK A COLD JOINT STRIP SHALL BE INSTALLED
- 6) MATERIALS SHALL BE SELECTED FROM THE APPROVED MATERIALS LIST

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## AIR RELEASE VALVE LOCATIONS

PALMETTO STATE UTILITY  
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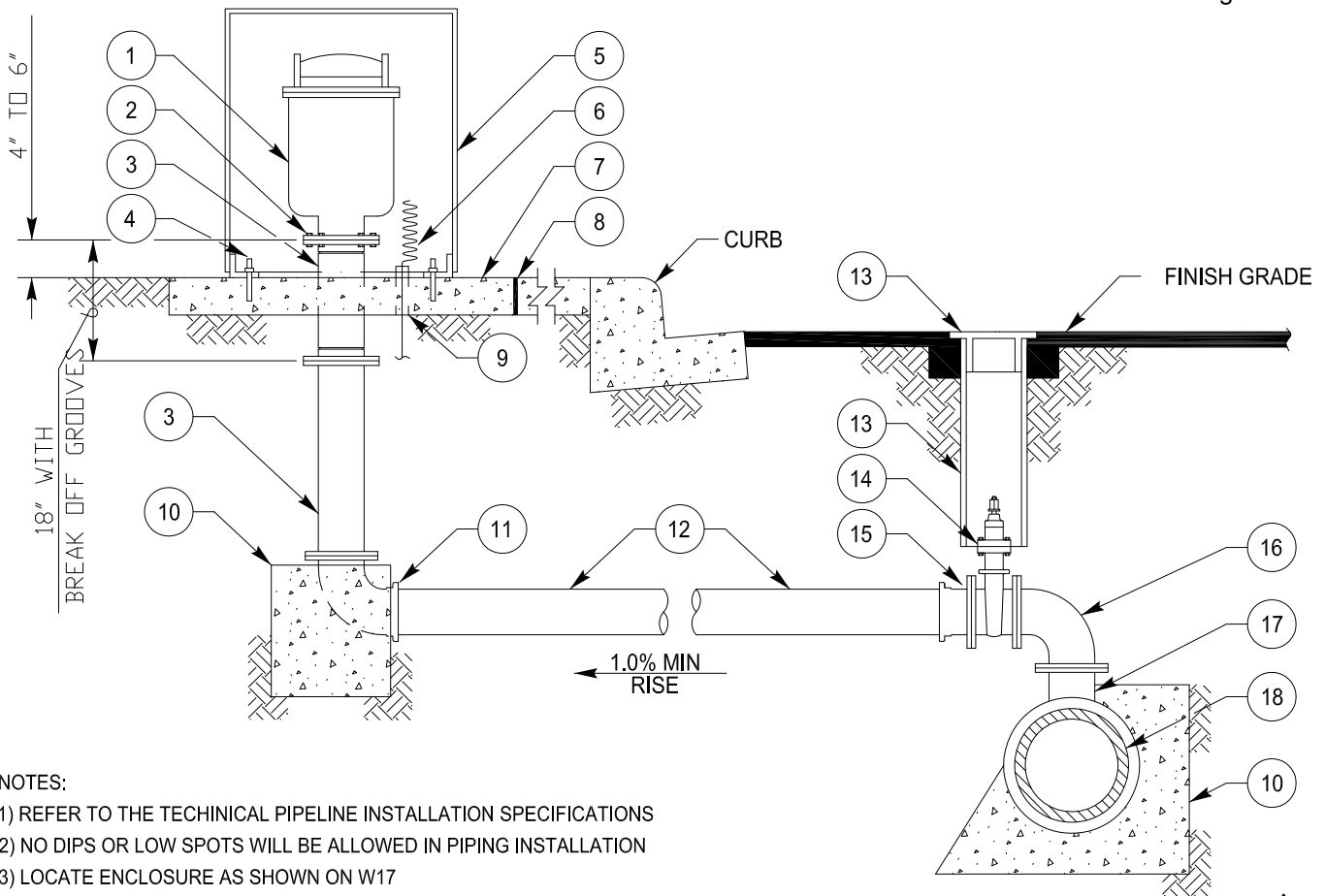
REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NEW DETAIL	SFM	3-16-09	Er

SCALF.

NTS

DRAWING NUMBER

Friday, May 27, 2011



NOTES:

- 1) REFER TO THE TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS
- 2) NO DIPS OR LOW SPOTS WILL BE ALLOWED IN PIPING INSTALLATION
- 3) LOCATE ENCLOSURE AS SHOWN ON W17
- 4) INSTALL WARNING/IDENTIFICATION TAPE ABOVE ALL HORIZONTAL PIPING
- 5) BREAK-AWAY BOLTS SHALL BE  $\frac{5}{8}$ " x 3" WITH  $\frac{3}{8}$ " HOLE DRILLED IN THE SHAFT OF THE BOLT. INSTALL WITH NUTS ON TOP OF THE FLANGE. BOLT SHAFT SHALL BE FILLED WITH SILICONE SEALANT
- 6) MATERIALS SHALL BE SELECTED FROM THE APPROVED MATERIALS LIST

ITEM NO	SIZE AND DESCRIPTION	ITEM NO	SIZE AND DESCRIPTION
1	4" AUTOMATIC COMBINATION AIR RELEASE & AIR/VACUUM VALVE ASSEMBLY WITH INSECT SCREEN	9	1" PVC CONDUIT FOR TRACER WIRE INSTALLED 2" ABOVE SLAB
		10	CONCRETE THRUST/ANCHOR BLOCK PER DWG G9
2	BREAK-AWAY BOLTS, SEE NOTE 5	11	4" FLG x MJ/PO 90 DEG. BEND
3	4" FLANGED 8-BOLT DUCTILE IRON PIPE x REQ'D LENGTH (MAX OF 2 SPOOLS)	12	4" C-900 PVC PIPE
4	1/2" x 3" STAINLESS STEEL DROP-IN ANCHORS (3 EA @ 120 DEG. APART)	13	8" VALVE BOX W/ LID SEE W10
		14	4" FLG x MJ/PO/FLG RWGV
5	ALL WEATHER ENCLOSURE	15	4" FLG x MJ/PO ADAPTER (IF REQUIRED)
6	TRACER WIRE		
7	42" X 42" X 6" THICK CONCRETE SLAB	16	4" FLANGE 90° BEND
		17	SIZE x 4" MJ/PO/FLG x FLG TEE
8	COLD JOINT STRIP	18	WATER MAIN

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: 4" AUTO AIR RELEASE & AIR/VAC VALVE

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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NEW DETAIL	SFM	3-16-09	Er

SCALF.

NTS

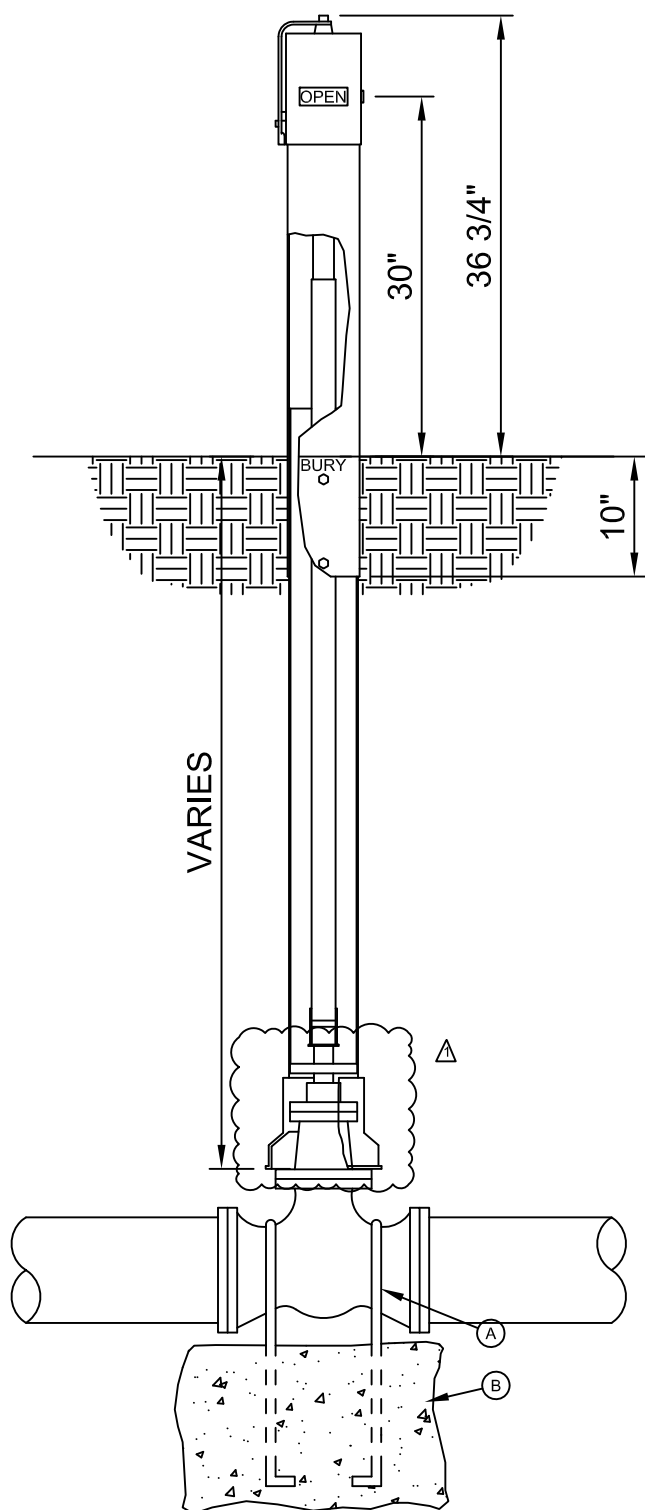
DRAWING NUMBER

W19

Friday, May 27

Friday, May 27





GENERAL NOTES:

- 1. THE CONTRACTOR SHALL INSTALL THE POST INDICATING VALVE PER MANUFACTURER'S INSTRUCTIONS.
- 2. PRODUCT SHALL BE A MUELLER A423 ADJUSTABLE INDICATOR POST OR APPROVED EQUAL.
- 3. PAINT SAFETY / CHROME YELLOW. SHERWIN WILLIAMS - INDUSTRIAL & MARINE COATINGS, INDUSTRIAL ENAMEL "ALKYD COATING", NUMBER B54 Y 37 / 617-4072, OR APPROVED EQUAL.

CONSTRUCTION KEY NOTES:

- (A) FOR INSTALLATION OF VALVE ANCHORS, SEE DETAIL W33.
- (B) 3000 PSI CONCRETE VALVE SUPPORT.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: POST INDICATING VALVE



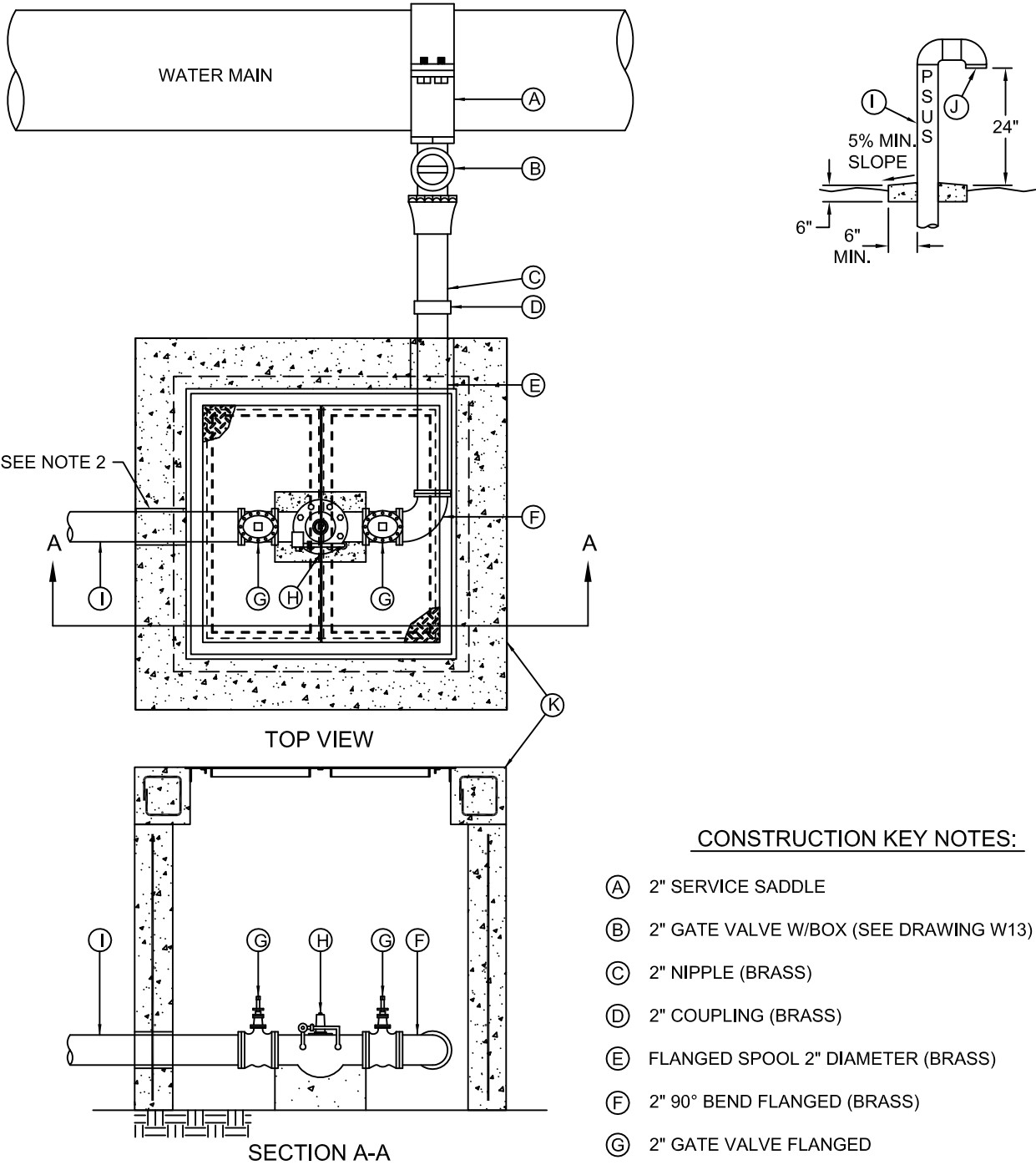
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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	VALVE STEM	SFM	3-16-09	

SCALE:  
**NTS**

DRAWING NUMBER  
**W19**

Friday, May 27, 2011




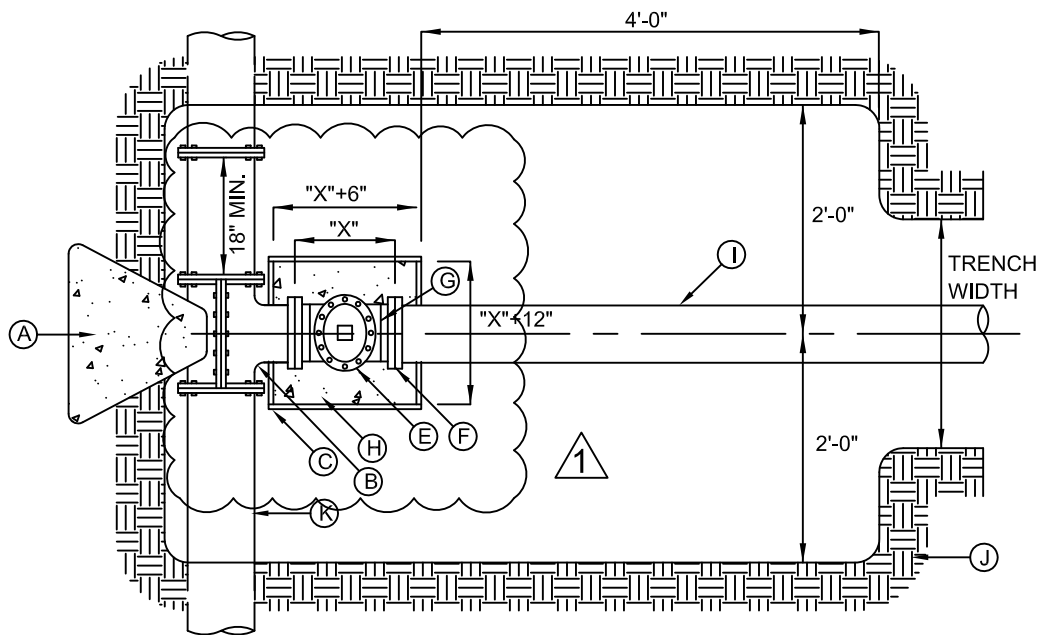
CONSTRUCTION KEY NOTES:

- (A) 2" SERVICE SADDLE
- (B) 2" GATE VALVE W/BOX (SEE DRAWING W13)
- (C) 2" NIPPLE (BRASS)
- (D) 2" COUPLING (BRASS)
- (E) FLANGED SPOOL 2" DIAMETER (BRASS)
- (F) 2" 90° BEND FLANGED (BRASS)
- (G) 2" GATE VALVE FLANGED
- (H) 2" PRESSURE RELIEF VALVE
- (I) 2" COPPER LINE CONNECTED TO A STORM SEWER INLET OR INSTALL A GOOSE NECK ABOVE GRADE WITH INSECT SCREEN.
- (J) INSECT SCREEN
- (K) CONCRETE BOX WITH BILCO HATCH.

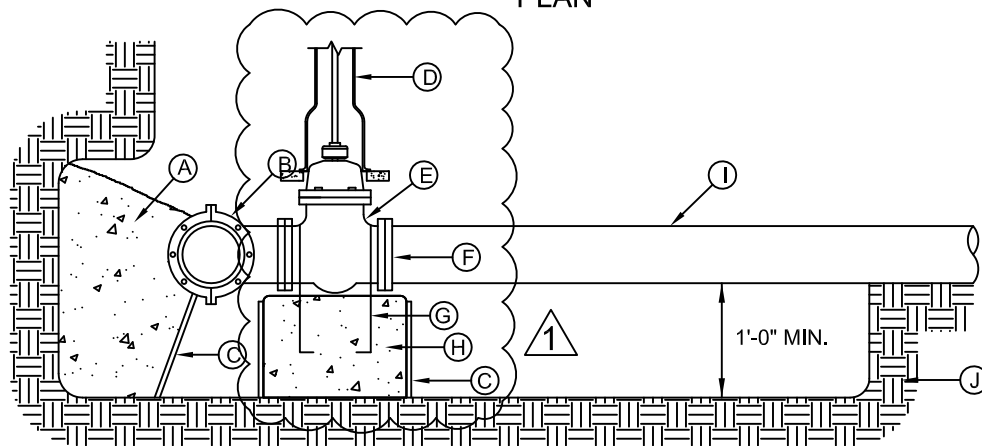
GENERAL NOTES:

- 1. PIPE PENETRATIONS SHALL HAVE LINK SEAL OR EQUAL.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON				TITLE: 2" PRESSURE RELIEF VALVE				
 <div><p><b>PALMETTO STATE UTILITY SERVICES, INC.</b></p><p>A Subsidiary of American States Utility Services, Inc.</p><p>Building 2576, Essayons Way Fort Jackson, SC 29207</p><p>Tel: (803) 790-7288 Fax: (803) 787-2054</p></div>	REVISIONS						SCALE:	
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	NTS	
			ORIGINAL ISSUE DATE		6-11-08		DRAWING NUMBER	
		1	NO CHANGES	SFM	3-16-09		W/20	
							Friday, May 27, 2011	



PLAN



SECTION

GENERAL NOTES:


CONSTRUCTION KEY NOTES:

- THRUST BLOCKING SHALL EXTEND TO UNDISTURBED EARTH.
- TAPPING SLEEVE SHALL BE 18" MINIMUM FROM ANY BELL, COUPLING, VALVE OR FITTING.
- JOINTS AND BOLTS SHALL BE CLEAR OF CONCRETE.
- INSTALL PERMANENT THRUST BLOCKING UNDERVALVE BEFORE TAP IS MADE. JOINTS AND BOLTS TO BE CLEAR OF CONCRETE.
- VALVE SHALL BE EPOXY COATED AND WRAPPED WITH POLYETHYLENE PLASTIC.
- SEE W13 FOR VALVE DETAILS.

- (A) CONCRETE THRUST BLOCKING, PER DETAIL G9 & G10.
- (B) TAPPING SLEEVE
- (C) FORMS
- (D) INSTALL VALVE BOX AND COVER PER DETAILS W9 & W10..
- (E) GATE VALVE
- (F) VALVE ENDS FOR TYPE OF PIPE INSTALLED
- (G) 2-#5 REBAR HAIRPINS, PAINT UNEMBEDDED PORTION OF BARS WITH 2-COATS OF COAL TAR EPOXY, THEN COVER WITH 2" MINIMUM OF CEMENT MORTAR.
- (H) CONCRETE VALVE SUPPORT, PER DETAIL W33.
- (I) NEW WATER LINE TO BE CONSTRUCTED.
- (J) UNDISTURBED EARTH
- (K) EXISTING WATER MAIN TO BE TAPPED

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: TAPPING SADDLE AND VALVE

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	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
			ORIGINAL ISSUE DATE		6-11-08		
		1	MOVED VALVE; ADDED NOTES	SFM	3-16-09		

GENERAL NOTES:

1. MATCHING SURFACES MARKED "MF" TO BE FINISHED OF ANY IRREGULARITIES THAT WOULD PREVENT A SNUG FIT.
2. CASTING TO BE SMOOTH AND VOID OF AIR HOLES.
3. PRODUCT SHALL BE U.S. FOUNDRY & MFG. CORP. ORDERED AS FOLLOWS:

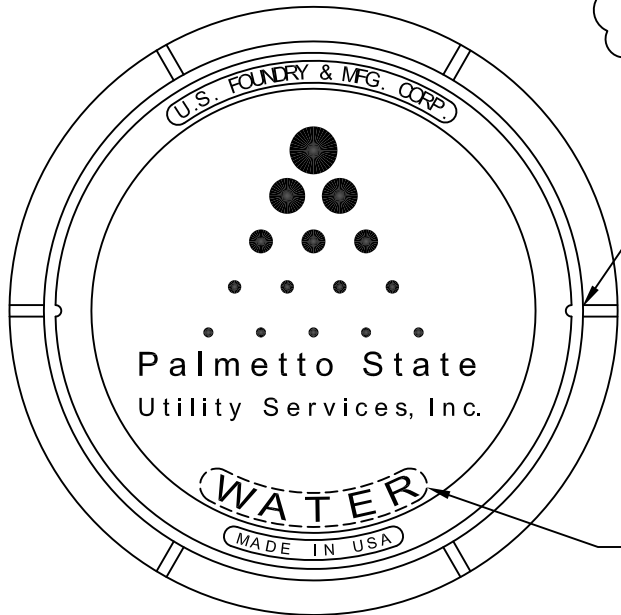
MATERIAL:ASTM - A48

GRAY IRON CLASS: 35B

RING WEIGHT: 260 LBS.

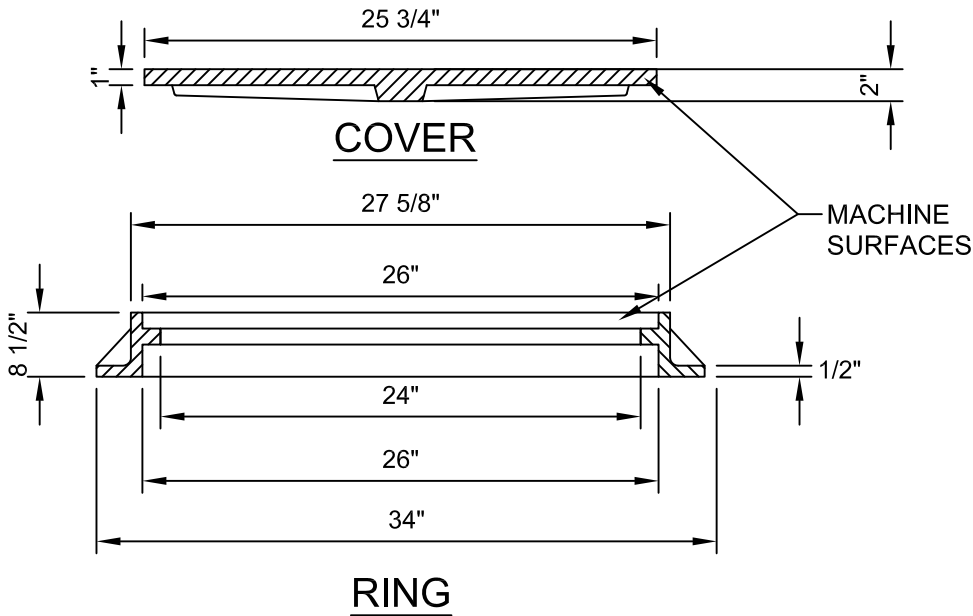
COVER WEIGHT: 140 LBS

ITEM NO.: 152 OV



(2) PENETRATING PICKHOLES

REMOVE NAME PLATE



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: 24" MANHOLE RING AND COVER



PALMETTO STATE UTILITY SERVICES, INC.

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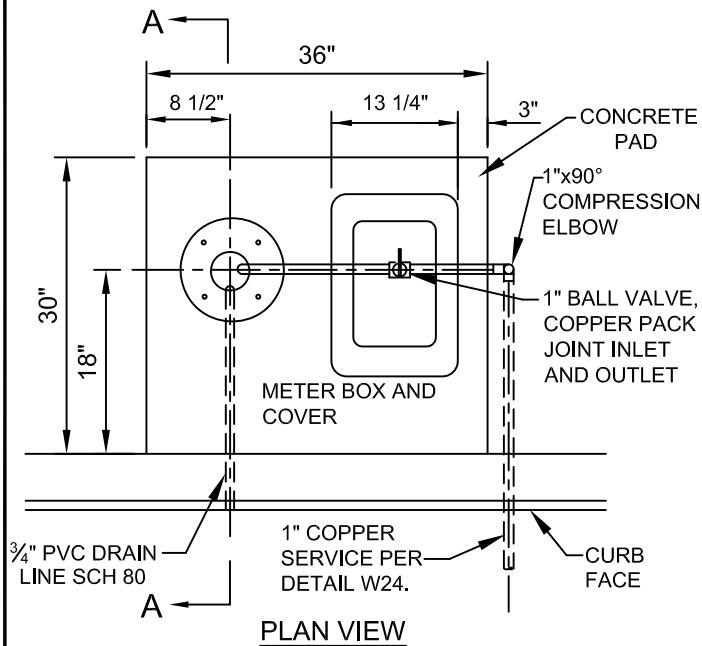
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REVISIONS						
ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
		ORIGINAL ISSUE DATE		6-11-08		
	1	ADD RING & COVER ORDER INFORMATION	SFM	3-16-09		

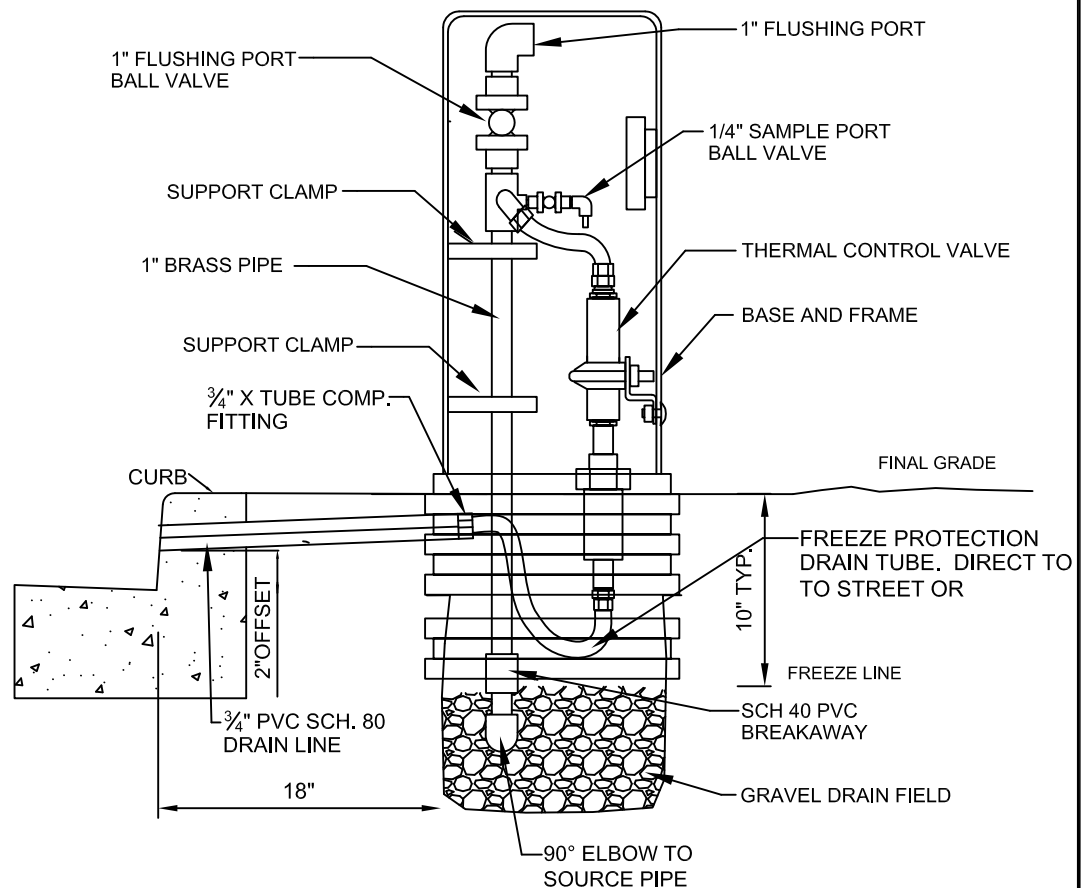
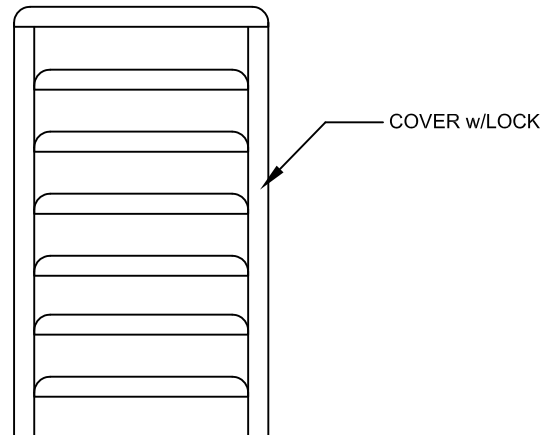
SCALE:
NTS
DRAWING NUMBER
W/22

Friday, May 27, 2011



GENERAL NOTES:

1. SAMPLING STATION SHALL BE SAFETY GUARD MODEL SG-BSS-03 OR APPROVED EQUAL.
2. IF EXISTING CURB IS CRACKED OR HAS AN EXPANSION JOINT WITHIN 3 FEET OF THE PROPOSED SAWCUT, EXTEND LIMITS OF CUT TO THAT POINT.
3. NO SAMPLERS SHALL BE INSTALLED BEYOND LIMITS OF PUBLIC RIGHT OF WAY WITHOUT EASEMENTS.
4. DOOR SHALL OPEN TO SIDE OPPOSITE VEHICULAR TRAFFIC.



SECTION A-A

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## SAMPLING STATION

PALMETTO STATE UTILITY  
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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NEW SHEET	SFM	3-16-09	Er

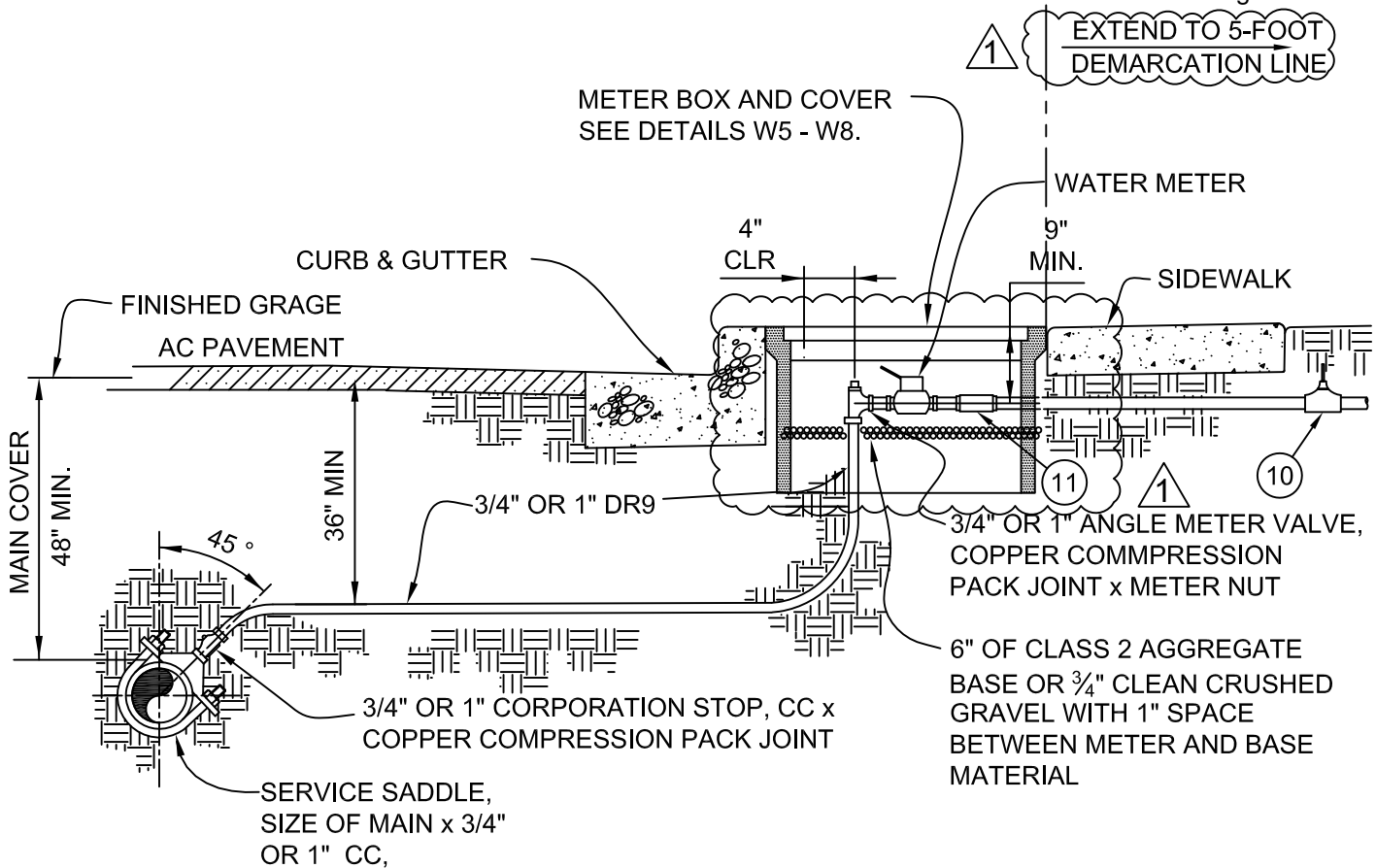
SCALF.

NTS

DRAWING NUMBER

W22

Friday, May 27, 2011



GENERAL NOTES:

1. WHEN SIDEWALK & CURB ABUT, PLACE THE METER BEYOND SIDEWALK.
2. 12" MINIMUM SPACING BETWEEN SERVICE TAPS.
3. SNAKE THE SERVICE LINE IN TRENCH TO PROVIDE ENOUGH SLACK TO ALLOW AT LEAST ONE FOOT OF THERMAL CONTRACTION PER 100 FEET OF LENGTH.
4. NO JOINTS PERMITTED IN SERVICE LINES.
5. NEW D.I.P. MAY BE DIRECT TAPPED
6. FOR 5/8"x3/4" METER, USE AN A24 ADAPTER.
7. FOR 3/4"x3/4" METER, USE AN A34 ADAPTER.
8. 1" ANGLE METER VALVE, 1" COPPER PACK JOINT x 3/4" METER NUT MAY BE UTILIZED WHEN SPECIFIED ON CONSTRUCTION PLANS.
9. SERVICES SHALL BE INSTALLED A MINIMUM OF 10 FEET FROM ALL SEWER LATERALS.
10. PRESSURE REGULATOR SOMETIMES LOCATED NEAR THE RESIDENCE.
11. A DUAL CHECK BACKFLOW PREVENTER SHALL BE INSTALLED ON THE OUTLET SIDE OF THE WATER.
12. ALL SERVICE ASSEMBLIES TO BE INSTALLED AT BUILDING EXTERIOR OUTSIDE THE 5-FOOT DEMARCATION LINE OF STRUCTURES.

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

3/4" OR 1" SERVICE

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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	UPDATE METER BOX, DEMARCATION NOTES	SFM	3-16-09	Er

SCALF.

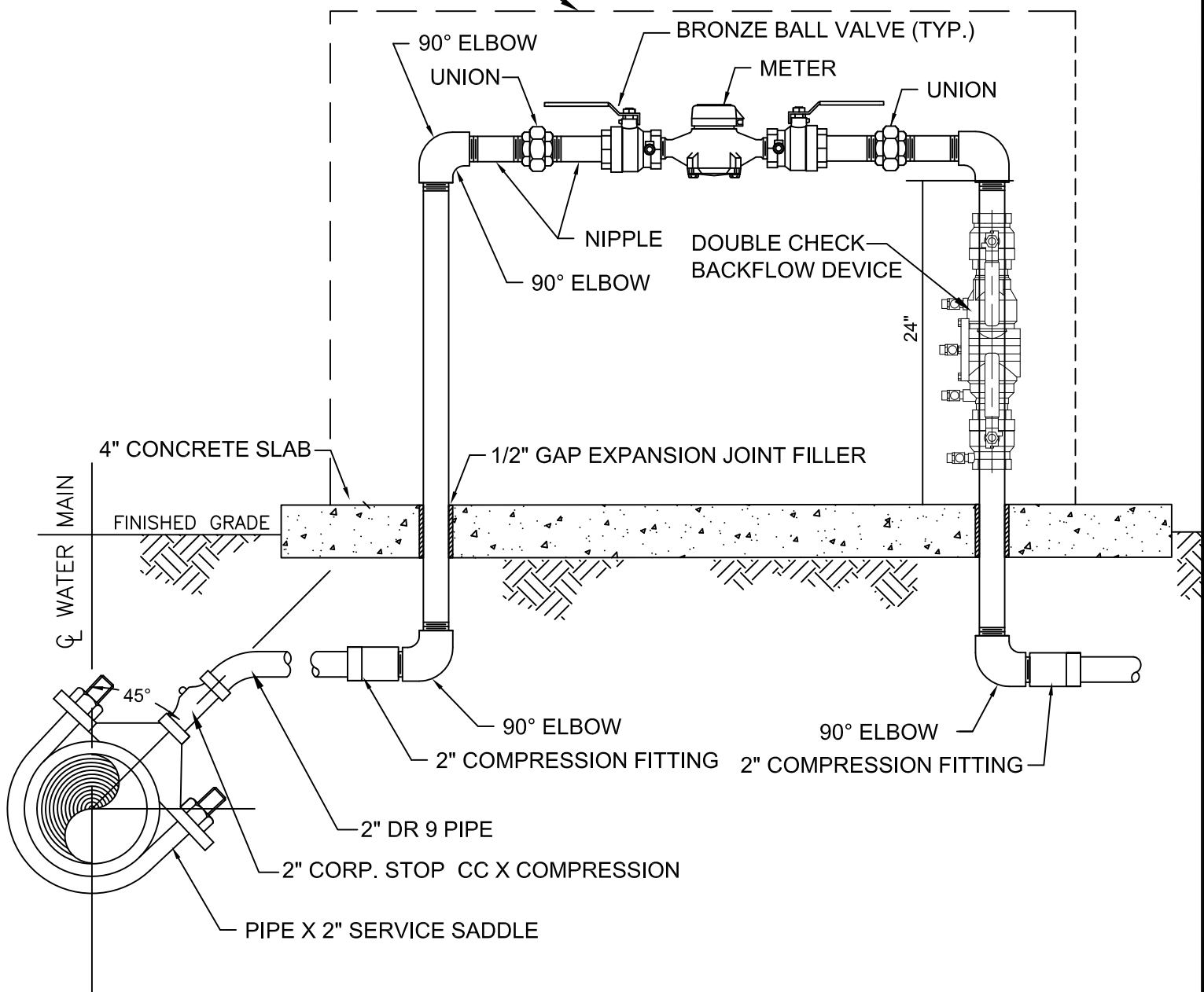
NTS

DRAWING NUMBER

W124

Friday, May 27, 2011

ALL WEATHER FIBERGLASS  
REINFORCED PLASTIC (FRP)  
ENCLOSURE.



### GENERAL NOTES:

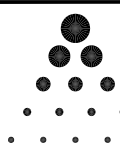
1

1. VERTICAL AND ABOVE-GRADE PIPING SHALL BE BRASS.
2. SEE DRAWING W30 FOR ENCLOSURE DETAILS.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

2" SERVICE



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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NEW ABOVEGROUND DETAIL	SFM	3-16-09	

SCALE:

NTS

Friday, May 27, 2011

W25

PRINCIPLE AND DOUBLE CHECK VALVES ASSEMBLIES

1. THE BACKFLOW PREVENTER SHALL BE INSTALLED 5' FROM THE WATER METER. THE BACKFLOW PREVENTER SHALL NOT BE INSTALLED CLOSER THAN 5' FROM ANY BUILDING FOUNDATION.
2. REDUCED PRESSURE PRINCIPLE ASSEMBLIES MUST BE INSTALLED IN A HORIZONTAL POSITION AND IN A LOCATION IN WHICH NO PORTION OF THE ASSEMBLY CAN BECOME SUBMERGED UNDER ANY CIRCUMSTANCES.
3. DOUBLE CHECK VALVE ASSEMBLIES MAY BE INSTALLED IN A VERTICAL POSITION, PROVIDED THE FLOW OF WATER IS IN AN UPWARD POSITION.
4. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTERS AND DOUBLE CHECK VALVE ASSEMBLIES MUST BE INSTALLED ABOVE GROUND.
5. BACKFLOW PREVENTION ASSEMBLIES OUTSIDE AND ABOVE GROUND MUST BE PROTECTED FROM FREEZING. THE BACKFLOW PREVENTION ASSEMBLY MUST BE INSTALLED BETWEEN MINIMUM AND MAXIMUM DISTANCES ABOVE GROUND OF 12 INCHES AND 48 INCHES RESPECTIVELY. LANDSCAPING IS ALLOWED AROUND THE BACKFLOW PREVENTER, BUT MUST NOT INTERFERE WITH THE REQUIRED ANNUAL TESTING, AND/OR REPAIR OF THE BACKFLOW PREVENTION ASSEMBLY. ROOT STRUCTURES OF PLANTINGS MUST BE GREATER THAN 18" BELOW THE SURFACE.
6. BACKFLOW PREVENTION ASSEMBLIES 2" AND LARGER MUST BE SUPPORTED TO ALLOW FOR THE WEIGHT OF THE BACKFLOW PREVENTION ASSEMBLY. SUPPORT AND FOOTING CONSTRUCTION MUST BE OF TYPE AND MATERIAL SUFFICIENT TO SUPPORT THE ASSEMBLY. SUPPORTS MUST HAVE A PROPER FOOTING (4 INCHES OF CONCRETE) FOR SUPPORTS TO REST UPON. BACKFLOW PREVENTION ASSEMBLY SUPPORTS MUST NOT INTERFERE WITH THE OPERATION OF VALVES, TEST COCKS, TESTING, AND/OR REPAIR OF THE BACKFLOW PREVENTION ASSEMBLY.
7. ALL PIPING LARGER THAN 3" IN DIAMETER MUST BE OF DUCTILE IRON, OR STEEL. 2" DIAMETER PIPING MUST BE BRASS.
8. BEFORE STARTING INSTALLATION OF A BACKFLOW PREVENTER, CONTACT PALMETTO STATE UTILITY SERVICES TO ENSURE THE PROPER INSTALLATION OF THE BACKFLOW PREVENTION ASSEMBLY AND ENSURE THAT THE BACKFLOW PREVENTER MEETS THE CURRENT PSUS APPROVAL LIST, AS SPECIFIED.
9. ALL ASSEMBLIES FOR USE IN THE PSUS SYSTEM SHALL MEET MANUFACTURER QUALITY ASSURANCES, AS STATED IN THE SPECIFICATIONS.
10. BACKFLOW PREVENTION ASSEMBLIES 2" AND SMALLER SHALL HAVE 1/4 TURN, FULL PORT, RESILIENT SEATED, BRONZE BALL VALVE SHUT-OFF.
11. ASSEMBLIES TWO AND ONE HALF INCH, 3", AND LARGER SHALL HAVE RESILIENT WEDGE SHUT-OFF VALVES; THE BACKFLOW PREVENTER AND RESILIENT WEDGE SHUT-OFF VALVES MUST BE FUSE BONDED EPOXY COATED.
12. INSULATION SHALL BE FURNISHED AND DESIGNED BY THE MANUFACTURER OF THE ENCLOSURE, TO MAINTAIN AN INTERIOR TEMPERATURE OF +40° F WITH AN EXTERIOR /OUTSIDE TEMPERATURE OF -30°F AND A WIND VELOCITY OF 15 MPH.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: CROSS CONNECTION CONTROL NOTES



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REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
		ORIGINAL ISSUE DATE		6-11-08	
	1	NO CHANGES	SFM	3-16-09	

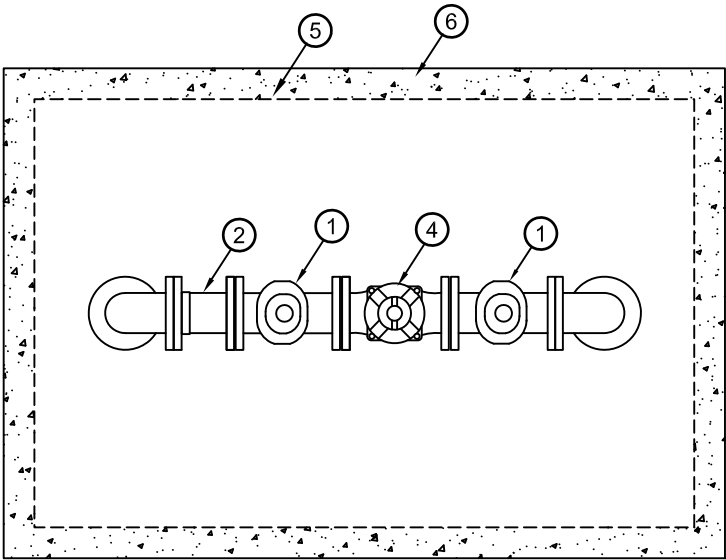
SCALE:

**NTS**

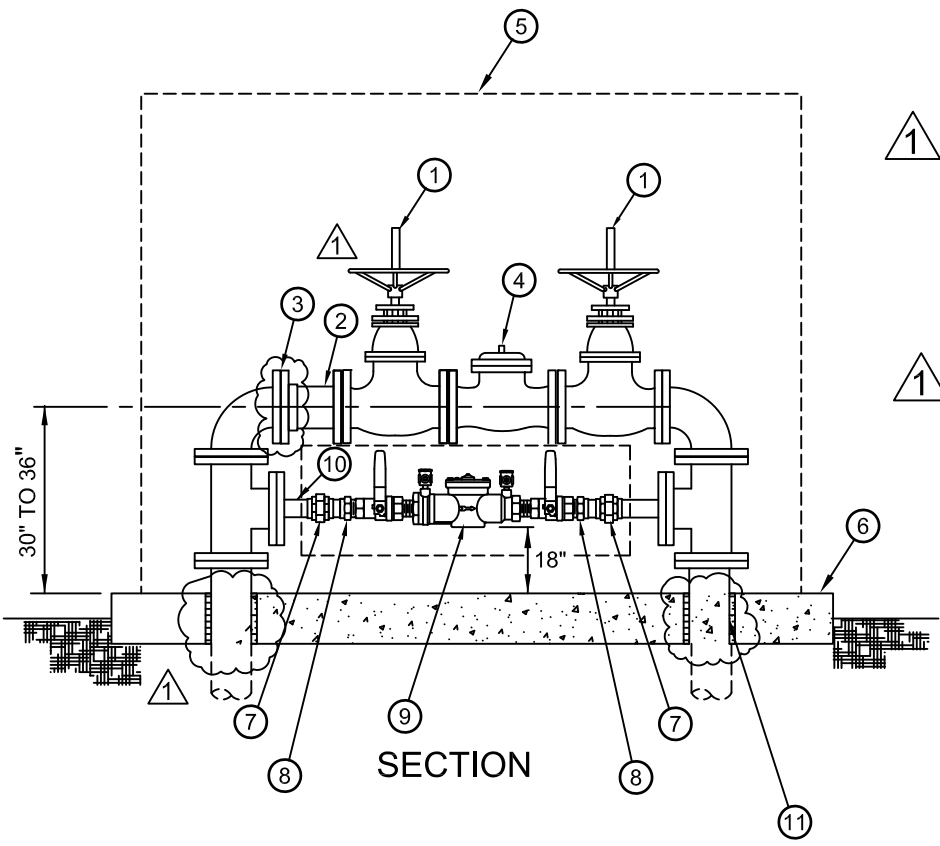
Friday, May 27, 2011

**W26**





PLAN



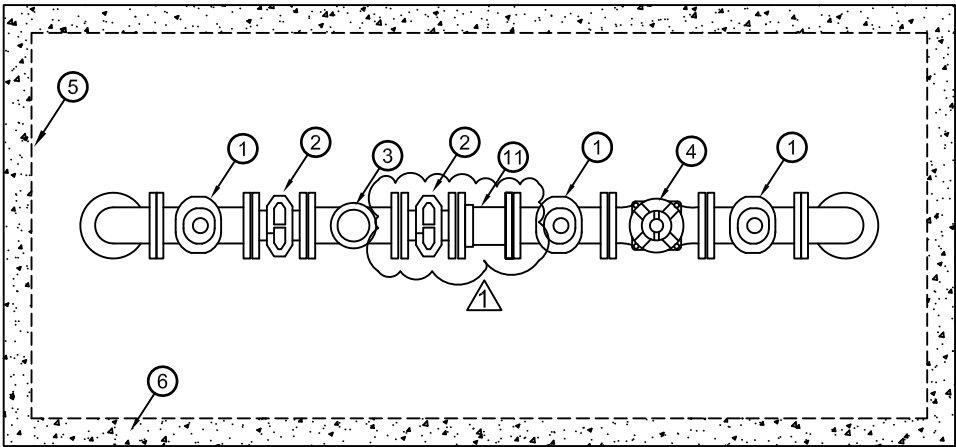
SECTION

GENERAL NOTE:

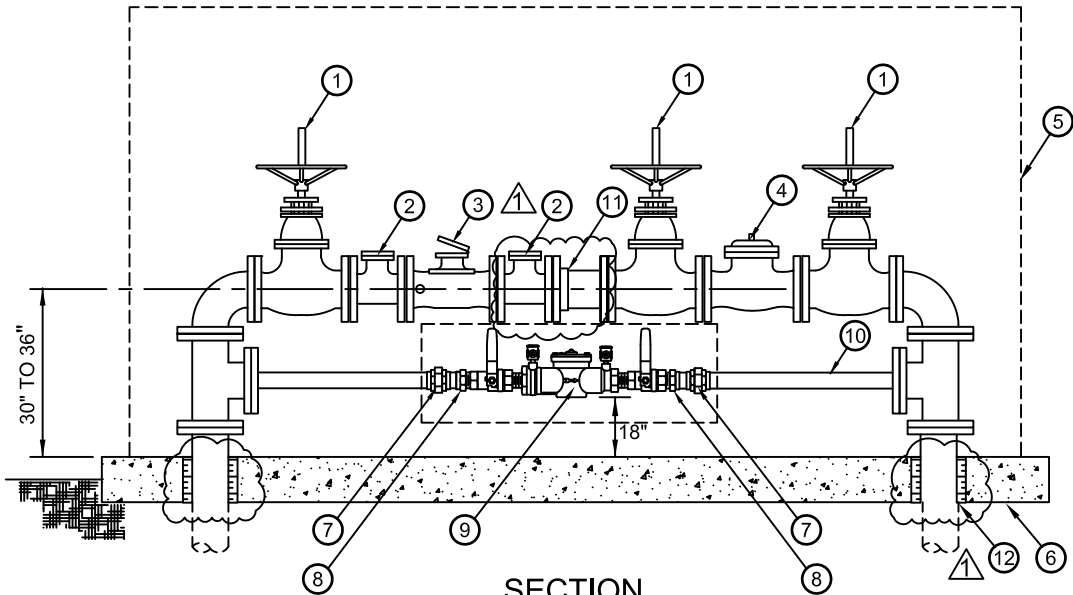
1. PIPING FITTINGS AND VALVES SHALL BE THE SAME SIZE AS THE (BFP) BACKFLOW PREVENTOR WITH THE EXCEPTION OF THE 3". THE 3" (BFP) SHALL HAVE 4" PIPING AND FITTINGS WITH REDUCERS TO CONNECT 3" (BFP).
2. PAINT ENCLOSURE SEMI-GLOSS FINISH. COLOR: ARMY BROWN, SPRAY-ON SEMI GLOSS (MINIMAL SHEEN FINISH), COMMERCIAL GRADE OUTDOOR AMERON-EPOXY OR ALKYD MATERIAL WITH BASE AND TOP COAT AS MAY BE REQUIRED TO PREVENT CHALKING, OR APPROVED EQUAL. FACTORY PAINT WITHIN 7 DAYS OF MANUFACTURE.
3. BACKFLOW PREVENTER SHALL BE AMES (WATTS) SERIES 2000SS (SERIES 774) OR EQUAL
4. ALL SERVICE ASSEMBLIES TO BE INSTALLED AT BUILDING EXTERIOR OUTSIDE 5-FOOT DEMARCATION LINE OF STRUCTURES.
5. ALL ABOVE GROUND PIPING SHALL BE METAL

KEY NOTES:

- ① GATE VALVE
- ② SPOOL PIECE FLG X PE
- ③ FLANGE ADAPTER
- ④ DOUBLE CHECK ASSEMBLY
- ⑤ FRP ALL WEATHER ENCLOSURE TO BE FACTORY PAINTED ARMY BROWN. SIZE AS REQUIRED. SEE DETAILS W30 AND W31.
- ⑥ CONCRETE SLAB AS SPECIFIED BY ENCLOSURE MANUFACTURER.
- ⑦ 2" BRASS UNION
- ⑧ 2" BRASS MALE ADAPTER
- ⑨ 2" BACKFLOW PREVENTER
- ⑩ 2" BRASS PIPE, TYPE K.
- ⑪ 1/2" GAP WITH EXPANSION JOINT FILLER (TYP)



PLAN



SECTION


KEY NOTES:

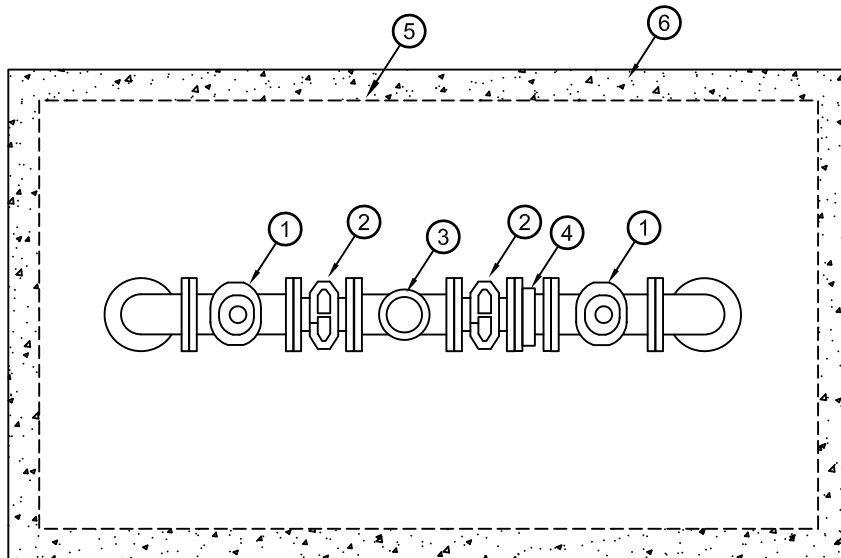
- 1 GATE VALVE
- 2 STRAINER
- 3 AWWA CLASS II METER W/MEGA LUGS. MANUFACTURER: MASTER METER TYPE:
  - DUAL BODY COMPOUND METER FOR SIZES 2", 3", 4", 6"
  - MMT TURBINE METER FOR SIZES 8", 10"
- 4 DOUBLE CHECK ASSEMBLY
- 5 FRP ALL WEATHER ENCLOSURE TO BE FACTORY PAINTED ARMY BROWN. SIZE AS REQUIRED. SEE DETAILS W30 AND W31.
- 6 CONCRETE SLAB AS SPECIFIED BY SAFE-T COVER MANUFACTURER.
- 7 2" BRASS UNION
- 8 2" BRASS MALE ADAPTER
- 9 2" BACKFLOW PREVENTER
- 10 2" BRASS PIPE, TYPE K.
- 11 SPOOL PIECE FLG X PE
- 12 1/2" GAP WITH EXPANSION JOINT FILLER

GENERAL NOTES:

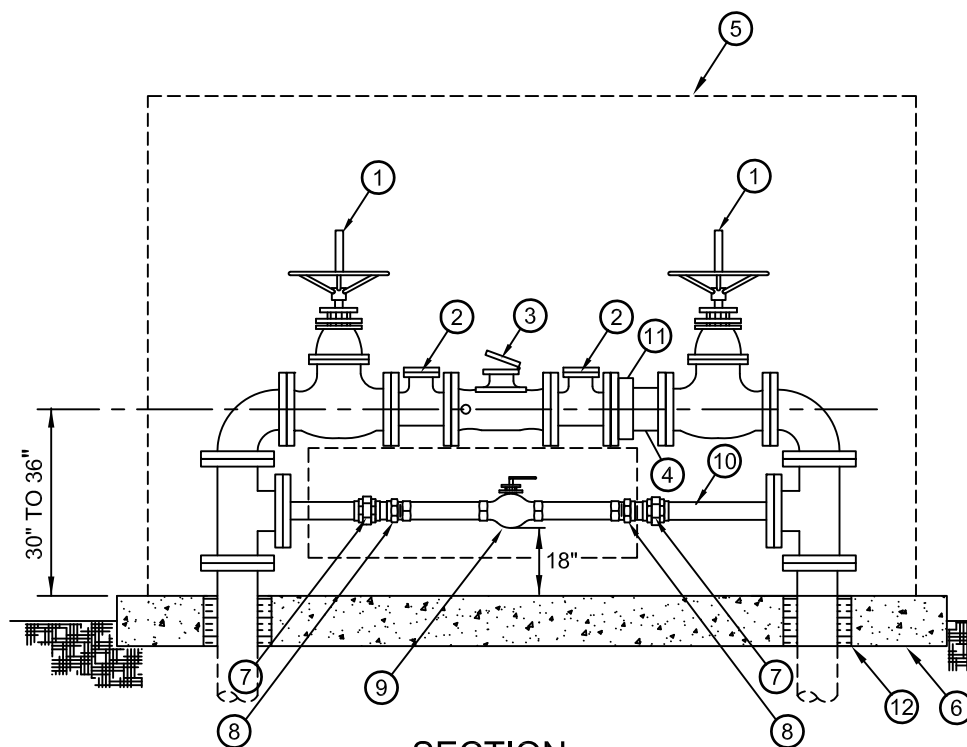
- 1. PIPING FITTINGS AND VALVES SHALL BE THE SAME SIZE AS THE (BFP) BACKFLOW PREVENTOR WITH THE EXCEPTION OF THE 3". THE 3" (BFP) SHALL HAVE 4" PIPING AND FITTINGS WITH REDUCERS TO CONNECT 3" (BFP).
- 2. PAINT ENCLOSURE SEMI-GLOSS FINISH. COLOR: ARMY BROWN, SPRAY-ON SEMI GLOSS (MINIMAL SHEEN FINISH), COMMERCIAL GRADE OUTDOOR AMERON-EPOXY OR ALKYD MATERIAL WITH BASE AND TOP COAT AS MAY BE REQUIRED TO PREVENT CHALKING, OR APPROVED EQUAL, FACTORY PAINT WITHIN 7 DAYS OF MANUFACTURE.
- 3. BACKFLOW PREVENTER SHALL BE AMES (WATTS) SERIES 2000SS (SERIES 774) OR EQUAL
- 4.
- 5. ALL SERVICE ASSEMBLIES TO BE INSTALLED AT BOULING EXTERIOR OURSIDE 5-FOOT DEMARCATION LINE OF STRUCTURES.
- 6. ALL ABOVE GROUND PIPING SHALL BE METAL.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON TITLE: 3"-10" BACKFLOW PREVENTER W/ METER

 <p><b>PALMETTO STATE UTILITY SERVICES, INC.</b> A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054</p>	REVISIONS						SCALE: <b>NTS</b> Friday, May 27, 2011 <b>W28</b>
	ZONE	REV.	DESCRIPTION	BY	DATE	APP.	
			ORIGINAL ISSUE DATE		6-11-08		
		1	REV. GAP, METER, ENCL., ADD STRAINER & SPOOL	SFM	3-16-09		



PLAN



SECTION

1. PIPING FITTINGS AND VALVES SHALL BE THE SAME SIZE AS THE METER.
2. PAINT IN SEMI-GLOSS FINISH. COLOR: ARMY BROWN, SPRAY-ON SEMI GLOSS (MINIMAL SHEEN FINISH), COMMERCIAL GRADE OUTDOOR AMERON-EPOXY OR ALKYD MATERIAL WITH BASE AND TOP COAT AS MAY BE REQUIRED TO PREVENT CHALKING, OR APPROVED EQUAL. FACTORY PAINT WITHIN 7 DAYS OF MANUFACTURING.
3. AWWA CLASS II METER  
 MANUFACTURER: MASTER METER  
 TYPE:
  - DUAL BODY COMBINATION METER FOR SIZES 2", 3", 4", 6"
  - MMT TURBINE METER FOR SIZES 8", 10"
4. ALL SERVICE ASSEMBLIES TO BE INSTALLED AT BUILDING EXTERIOR OUTSIDE 5-FOOT DEMARCATION LINE OF STRUCTURES.
5. ALL ABOVE GROUND PIPING SHALL BE METAL.

**KEY NOTES:**

- ① GATE VALVE
- ② STRAINER
- ③ AWWA CLASS II METER
- ④ SPOOL PIECE (LENGTH AS REQUIRED)
- ⑤ FRP ALL WEATHER ENCLOSURE TO BE FACTORY PAINTED ARMY BROWN. SIZE AS REQUIRED. SEE DETAILS W30 AND W31.
- ⑥ CONCRETE SLAB AS SPECIFIED BY ENCLOSURE MANUFACTURER.
- ⑦ 2" BRASS UNION
- ⑧ 2" BRASS MALE ADAPTER
- ⑨ 2" BALL VALVE
- ⑩ 2" BRASS PIPE, TYPE K.
- ⑪ FLANGE COUPLING ADAPTER
- ⑫ 1/2" GAP WITH EXPANSION JOINT FILLER

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: 3"-10" METER W/O BACKFLOW PREVENTER



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ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	1	NEW SHEET	SFM	3-16-09	

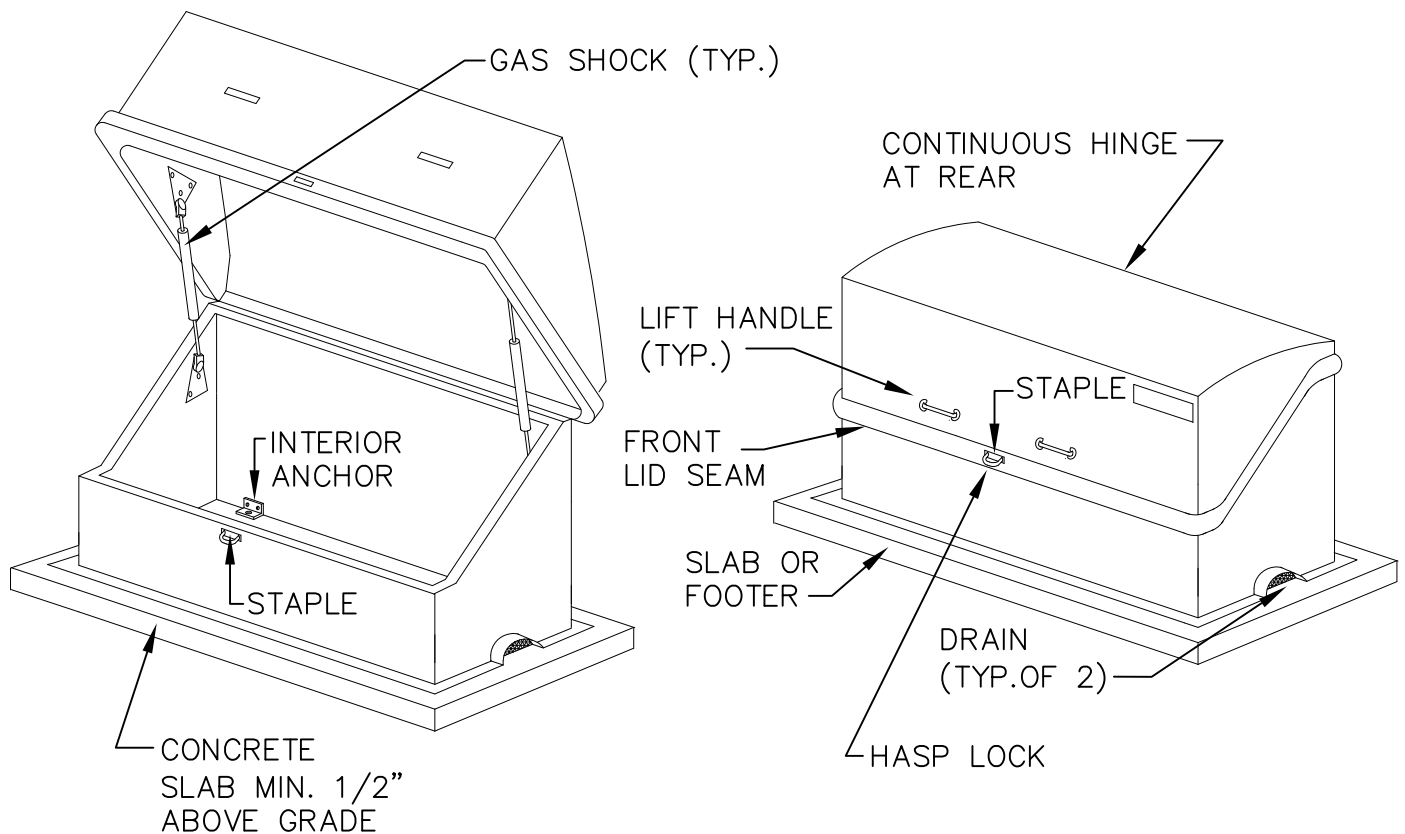
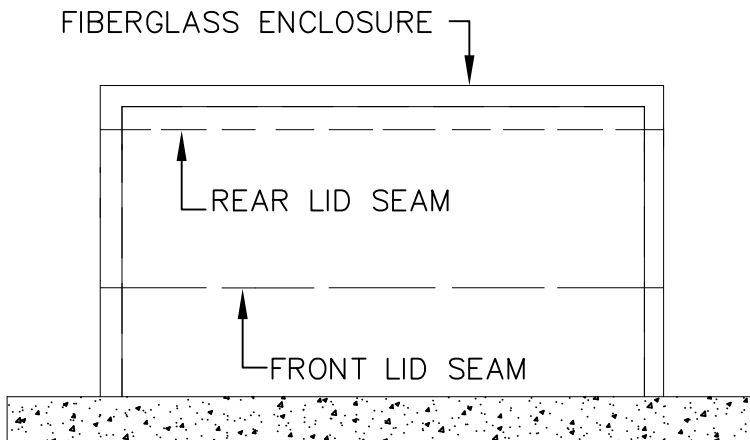
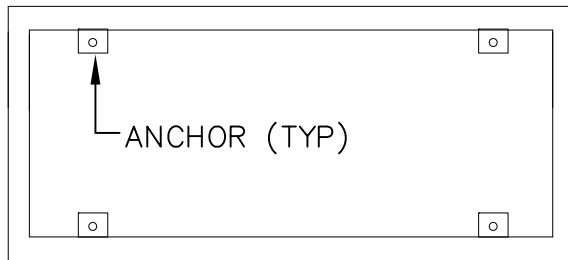
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Friday, May 27, 2011  
**W29**

NOTES

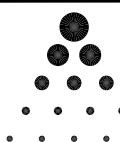
1. ALL DIMENSIONS ARE APPROXIMATED IN INCHES.
2. PROVIDE SLAB PER MANUFACTURERS RECCOMENDATIONS.
3. THE ENCLOSURE SHALL BE INSULATED TO PREVENT FREEZING OF COMPONENTS. MANUFACTURER SHALL SUPPLY INSULATION TECHNICAL DATA SHOWING R-VALUE AND EXPOSURE RATING.
4. COLOR SHALL BE ARMY BROWN.



STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

ALL WEATHER ENCLOSURE



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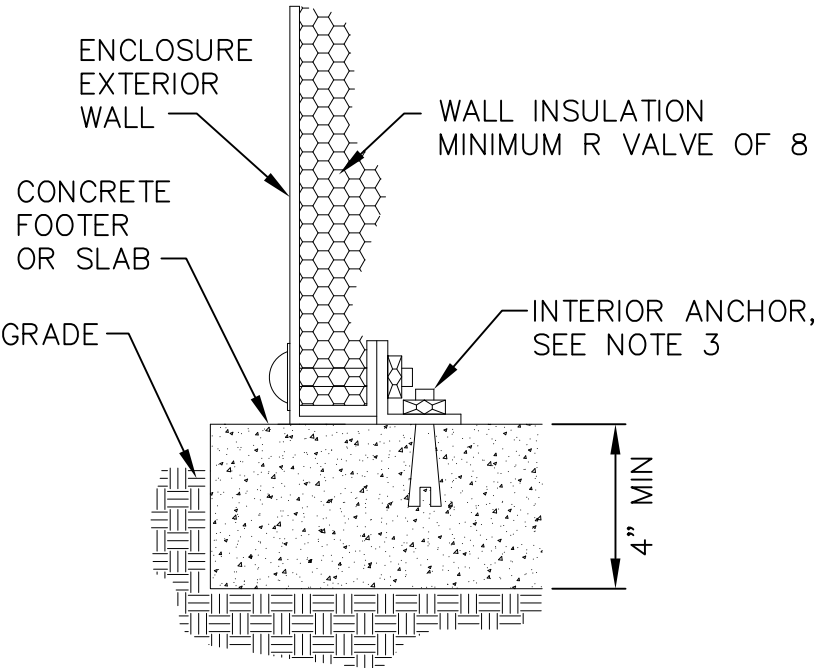
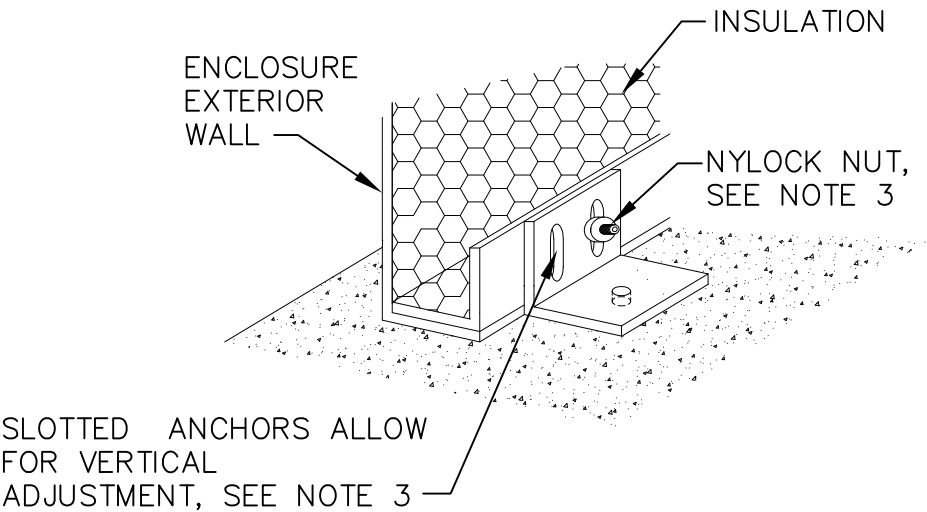
REVISIONS					
ZONE	REV.	DESCRIPTION	BY	DATE	APP.
	1	NEW SHEET	SFM	3-16-09	

SCALE:


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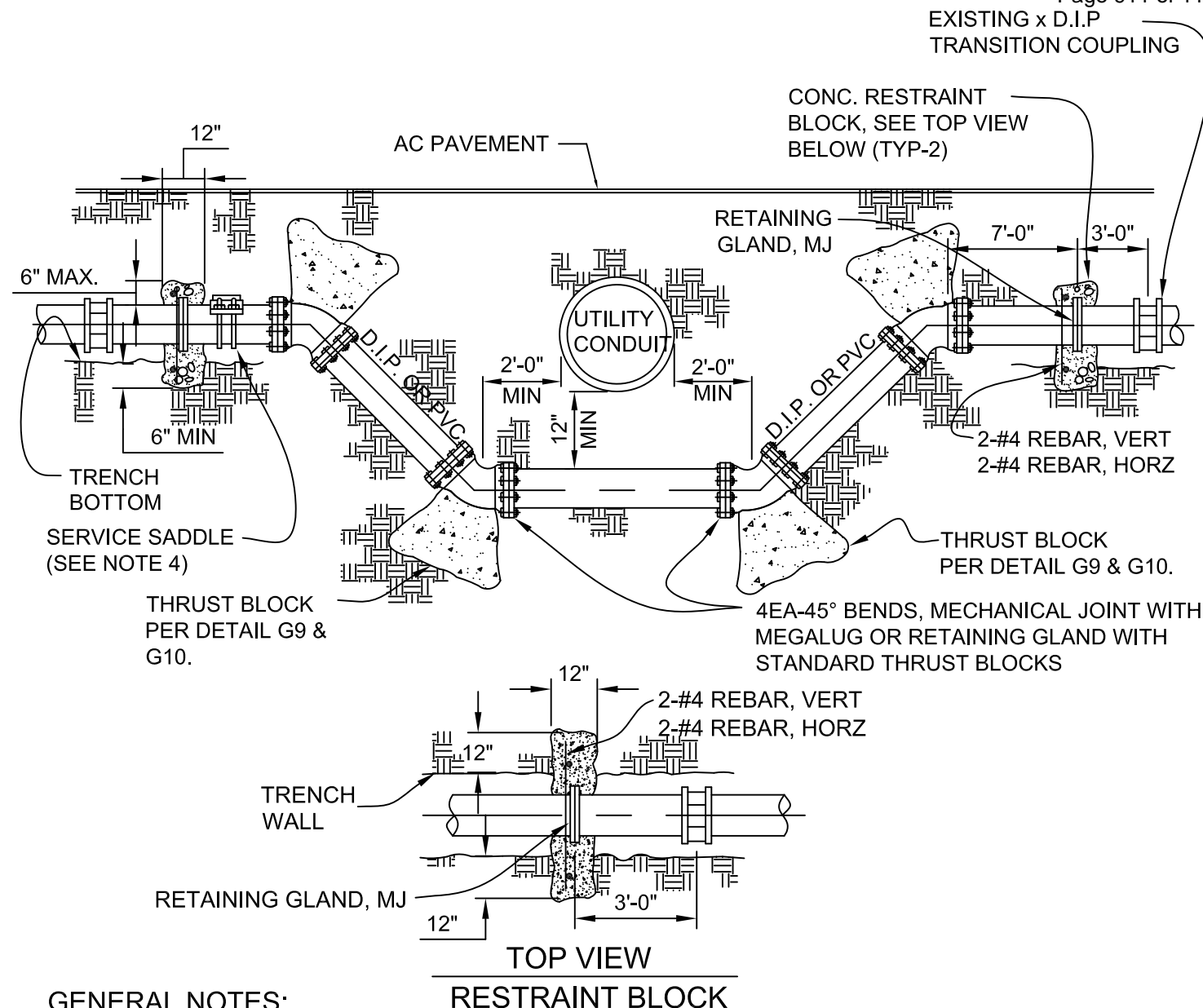
**W30**

Friday, May 27, 2011



- NOTES
- 1. ALL DIMENSIONS ARE APPROXIMATED IN INCHES.
  - 2. RECOMMENDED SLAB SIZE TO MEET OR EXCEED MANUFACTURER'S RECOMMENDATIONS.
  - 3. ANCHORS TO BE MADE OF NONFERROUS MATERIALS PER MANUFACTURER'S RECOMMENDATIONS.
  - 4. SEE CROSS CONNECTION CONTROL NOTES FOR ADDITIONAL REQUIREMENTS.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON					TITLE: ENCLOSURE ANCHOR							
<div><p><b>PALMETTO STATE UTILITY SERVICES, INC.</b> A Subsidiary of American States Utility Services, Inc. Building 2576, Essayons Way Fort Jackson, SC 29207 Tel: (803) 790-7288 Fax: (803) 787-2054</p></div>					REVISIONS						SCALE:	
					ZONE	REV.	DESCRIPTION	BY	DATE	APP.	NTS	
						1	NEW SHEET	SFM	3-16-09		Friday, May 27, 2011	
											W31	

**GENERAL NOTES:**

1. THE RESTRAINT BLOCKS SHALL BE A MINIMUM OF 24" IN HEIGHT AND 12" THICK. THE TOP OF THE BLOCK SHALL BE NO MORE THAN 6" ABOVE TOP OF PIPE.
2. ALL PIPE JOINTS AT 90° BENDS SHALL BE MECHANICAL JOINT WITH MEGALUG OR RETAINING GLAND. FLANGED JOINTS MAY BE USED WHERE CONDITIONS WARRANT.
3. INSTALLATION SHALL BE ENCASED IN A POLYETHYLENE WRAPPER PER AWWA STANDARD C105.
4. SERVICE SADDLE SHALL BE INSTALLED ON THE HIGH POINTS OF THE OFFSET FOR THE INSTALLATION OF AIR/VAC RELEASE VALVE, AS SPECIFIED ON THE PLAN OR BY THE INSPECTOR. SERVICE SADDLE SHALL BE 1" ON 8" AND SMALLER EXISTING MAINS AND 2" ON LARGER EXISTING MAINS.
5. IF BOTTOM CHORD EXCEEDS 18', CONNECT PIPE SECTIONS WITH APPROVED RESTRAINT JOINTS.

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: 45° MECHANICAL JOINT UTILITY INVERT

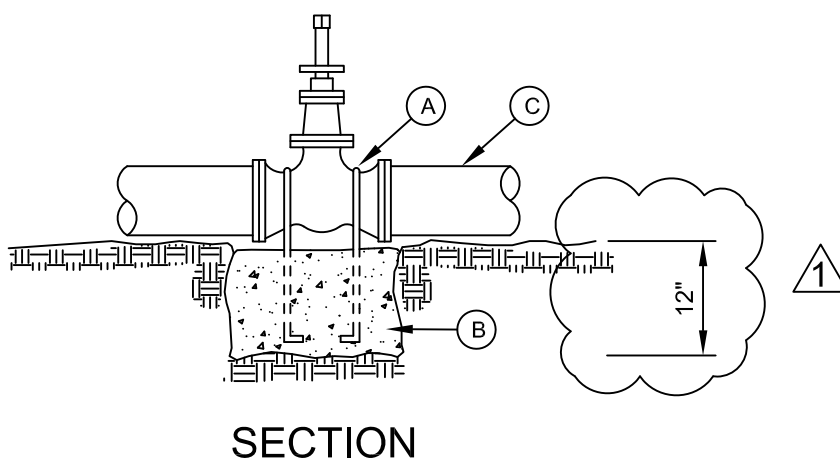
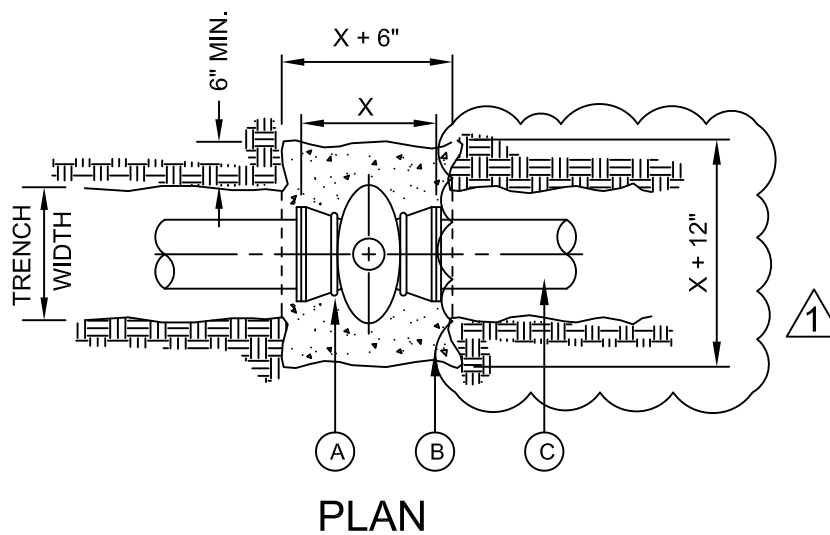
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A Subsidiary of American States Utility Services, Inc.		ZONE	REV.	DESCRIPTION	BY	DATE	APP.	NTS	
Building 2576, Essayons Way Fort Jackson, SC 29207			1	NEW SHEET	SFM	3-16-09		Friday, May 27, 2011	
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GENERAL NOTES:

CONSTRUCTION KEY NOTE Page

1. THE ENGINEER SHALL PROVIDE DESIGN FOR ALL VALVES GREATER THAN 12".
2. COMPLY WITH REQUIREMENTS OF AWWA C-550, PROTECTIVE EPOXY INTERIOR COATINGS FOR VALVES.

- (A) TWO No.5 REBAR HAIR PINS. PAINT UNEMBEDDED PORTION OF REBARS WITH TWO COATS OF COAL TAR EPOXY.
- (B) CONCRETE VALVE SUPPORT, 3000 PSI. CONCRETE.
- (C) APPROVED PIPE.



# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## VALVE ANCHOR



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	1	ADDED DIMENSIONS	SFM	3-16-09	

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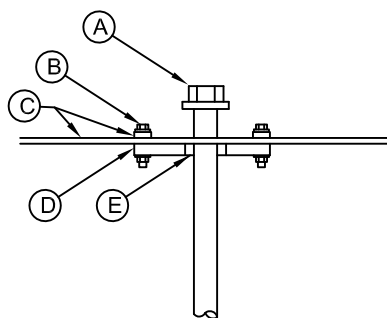
Friday, May 27, 2011

W33

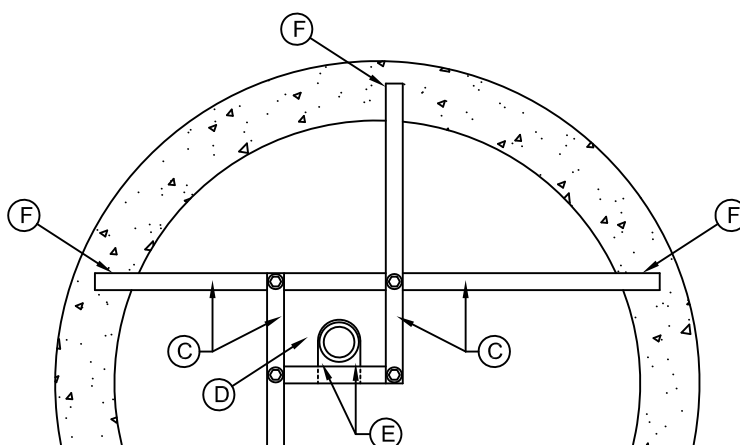
1. 1 1/4" DIAMETER STEEL EXTENSION  
STEM WITH SQUARE VALVE NUT AND 2"  
SQUARE OPERATING NUT ON TOP.

CONSTRUCTION KEY NOTES:

- (A) 2" SQUARE OPERATOR NUT
- (B) (4) 1/2" SS BOLTS, (4) 1/2" SS NUTS, AND (8) 1/2" SS WASHERS
- (C) 1"x3/8" STEEL BARS
- (D) STEEL PLATE 6"x4"x1/4"
- (E) NOTCH PLATE TO ALLOW 1/16" CLEAR FOR STEM.
- (F) EMBED BARS IN MANHOLE WALL



### ELEVATION VIEW



### PLAN VIEW

# STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE:

## STABILIZER UNIT DETAIL

PALMETTO STATE UTILITY  
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	1	NO CHANGES	SFM	3-16-09	

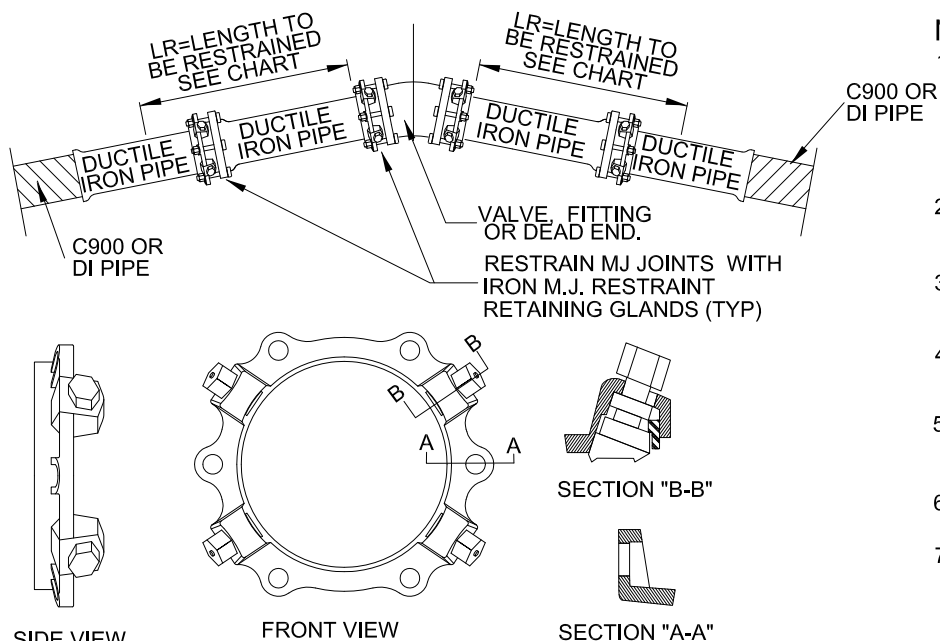
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Friday, May 27, 2011

W34



**NOTES:**

- 1.) THRUST RESTRAINT SHALL BE INSTALLED ON DUCTILE IRON WATER DISTRIBUTION LINES 6" THRU 12" DIAMETER IN THE MANNER SHOWN. SEE PSUS STANDARD THRUST BLOCK DETAIL FOR PVC RESTRAINT.
- 2.) IRON RETAINING GLAND M.J. RESTRAINT OR OTHER FORMS OF IRON RESTRAINT SHALL NOT BE USED ON PVC PIPE.
- 3.) PIPE GREATER THAN 12 INCH DIAMETER SHALL REQUIRE RESTRAINT JOINT PIPE FOR THE PROPER LENGTH.
- 4.) COMPACT FITTINGS ARE ACCEPTABLE. FOR USE WITH IRON RETAINING GLAND M.J. RESTRAINT.
- 5.) THE MINIMUM LENGTH OF RESTRAINT INDICATED SHALL REQUIRE ALL JOINTS WITHIN THE LR DISTANCE BE RESTRAINED.
- 6.) RESTRAINT SYSTEM SHALL BE INSPECTED AND APPROVED PRIOR TO BACKFILLING.
- 7.) RESTRAINT SYSTEMS MAY VARY BASED UPON THE ENGINEERS' DESIGN AS SHOWN ON THE PLAN AND PROFILE SHEETS.

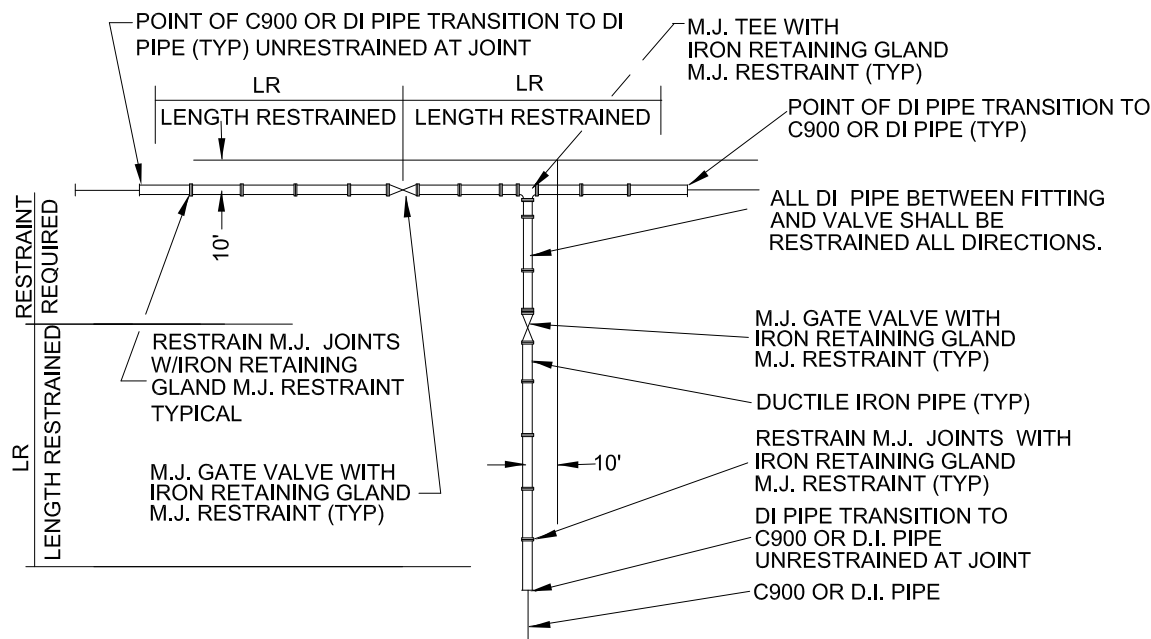
8" SIZE SHOWN 6" &amp; 12" SIMILAR

**IRON RETAINING GLAND M.J. RESTRAINT**

IRON RETAINING GLAND M.J. RESTRAINT			
NOMINAL PIPE SIZE	WEDGES QUANTITY	BOLTS QUANTITY	PRESS RATING
6"	3	6	350
8"	4	6	350
12"	8	8	350

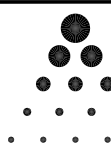
LR (MIN. LENGTH OF RESTRAINT EACH DIRECTION OF THRUST IN LINEAR FEET)  
Based on 150 psig pressure, Safety Factor of 2.5:1, BARE DI PIPE AND ML Soil, 3' cover  
Chart does not apply to pipes wrapped in polyethylene wrap

PIPE SIZE	VALVES DEAD ENDS TEES	90° ELBOWS	45° ELBOW & CROSSES	22-1/2° ELBOWS	REDUCER
6"	67'	37'	15'	7'	8"X2" 67'
8"	87'	49'	20'	10'	8"X6" 36'
12"	122'	68'	28'	13'	12"X8" 65'

**RESTRAINED JOINT DETAIL FOR TYPICAL TEE INTERSECTION**

4 WAY INTERSECTION SIMILARLY RESTRAINED

STANDARD CONSTRUCTION DRAWING - FORT JACKSON

TITLE: **RESTRAINT DETAIL (DUCTILE IRON PIPE)**

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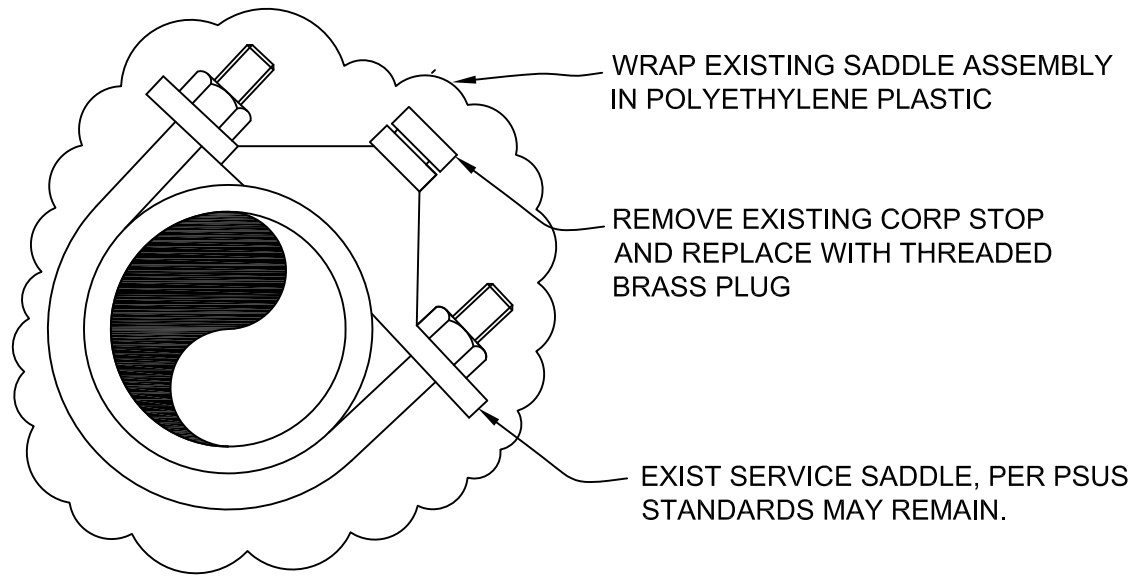
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Friday, May 27, 2011  
**W35**

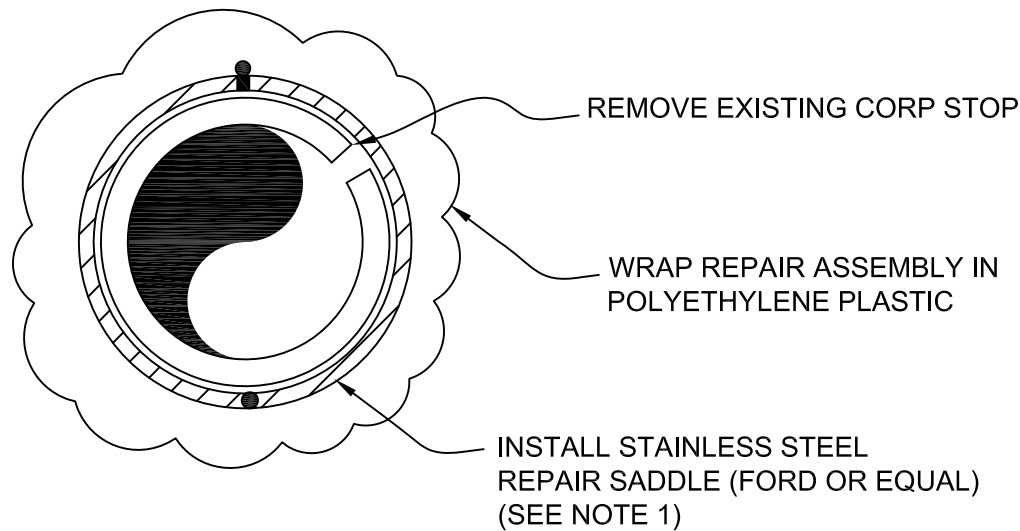
GENERAL NOTES:

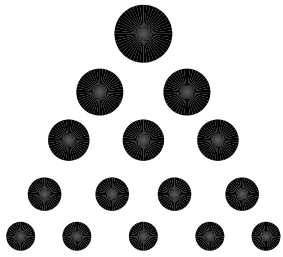
1. WHERE REPAIR CLAMPS WILL NOT FIT PIPE SECTION SHALL BE REMOVED AND NEW SECTION SLEEVED IN.

ABANDONMENT OF EXISTING SERVICE SADDLE



ABANDONMENT OF DIRECT TAP





# **Palmetto State Utility Services, Inc.**

**A**

**Subsidiary of American States Utility Services, Inc.**

**which is a**

**Subsidiary of American States Water Company**

## **POTABLE WATER MATERIALS GUIDELINE**

**for**

## **Fort Jackson**

# PALMETTO STATE UTILITY SERVICES, INC.

## POTABLE WATER MATERIALS GUIDELINE TABLE OF CONTENTS

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**SECTION 1 - BRASS FITTINGS**

Brass fittings for service lines shall meet AWWA Standard C800-01 and have the ability to pass standard pressure testing following installation. For convenience, the following tables list the applicable model numbers of frequently used parts from selected manufacturers. All fittings shall be designed for high-pressure per AWWA C 800-01 Section 4.2.3 (150 psi).

**1.1 Service Saddles****Size of Main x CC Thread**

PIPE TYPE	MANUFACTURERS MODEL NUMBER					
	JONES	FORD	MUELLER	ROMAC	SMITH/ BLAIR	A. Y. MCDONALD
PVC PIPE C – 900	J996	S90	H13400 series	202BS	393	3805
DUCTILE IRON	-----	FC202	DR2S series	202N	391	----
AC PIPE CL 150 – 200	J979	202B	BR2B series	202B	323	3825
STEEL MAINS	-----	F202	BR2A series	202	313	----

**Size of Main x FIP**

PIPE TYPE	MANUFACTURERS MODEL NUMBER		
	FORD	JONES	MUELLER
PVC PIPE C-900	S 91 (6" and 8") 202BS (10" and larger)	J-996 (6" and 8") J-969 (10" and larger)	H-13400 series

**1.2 Corporation Stops**

SIZE AND CONNECTIONS	MANUFACTURERS MODEL NUMBER			
	FORD	JONES	MUELLER	A.Y. MCDONALD
1" CC X COPPER PACK JOINT	F1000	J3401	H15008	4701-22
1" CC X PE PACK JOINT	F1001	J3402	H15009	4701-33
1" CC X MIP	F400	J45	H9996	3128
2" CC X COPPER PACK JOINT	FB1000	J1937	H15013	4701B-22
2" CC X PVC PACK JOINT	FB1002	J1977	P25008	4701B-44

**1.3 Angle Meter Valves**

SIZE AND CONNECTIONS	MANUFACTURERS MODEL NUMBER			
	FORD	JONES	MUELLER	A.Y. MCDONALD
3/4" COPPER PACK JOINT X METER NUT	KV43-332W	J4201	H14258	4602-22
1" COPPER PACK JOINT X METER NUT	KV43-444W	J4201	H14258	4602-22
1" PE PACK JOINT X METER NUT	KV63-444W	J4202	H14259	4602-33
1" FIP X METER NUT	KV13-444W	J1527	H-14265	4604
2" COPPER PACK JOINT X METER FLANGE	FV43-777W	J1975	B-24276	4602B-22
2" PVC PACK JOINT X METER FLANGE	FV73-777W	J1979	----	4602B-44

**1.4 Ball Valve Curb Stops**

SIZE AND CONNECTIONS	MANUFACTURERS MODEL NUMBER			
	MUELLER	FORD	JONES	A.Y. MCDONALD
1" COPPER PACK JOINT X COPPER PACK JOINT	B-25209	B44-444	J1949	6100-22
1" FIP X FIP	B-20283	B11-444W	J1900	6101W
2" PVC PACK JOINT X PVC PACK JOINT	—	B77-777	J1900 with 2-J2640	6100-44

**1.5 Straight Couplings and Adapters**

SIZE AND CONNECTIONS	MANUFACTURERS MODEL NUMBER			
	MUELLER	FORD	JONES	A.Y.MCDONALD
3/4" COPPER PACK JOINT X COPPER PACK JOINT	H-15403	C44-33	J2609	4758-22
3/4" PE PACK JOINT X COPPER PACK JOINT	H-15428 w/ H-15454	C46-33	J2612	4758-22-33
1" COPPER PACK JOINT X COPPER PACK JOINT	H-15403	C44-44	J2609	4758-22
1" PE PACK JOINT X COPPER PACK JOINT	H-15428 w/ H-15454	C46-44	J2612	4758-22-33
1" FIP X COPPER PACK JOINT	H-15451	C14-44	J2607	4754-22
2" COPPER PACK JOINT X COPPER PACK JOINT	H-15403	C44-77	J2609	4758-22
2" FIP X PVC PACK JOINT	----	C17-77	J2640	4754-44
1" PVC PACK JOINT X MIP	H-15429	C87-44	----	4753-44
1" METER NUT X MIP	H-10896	C38-44- 2	J130	4620

**1.6 Ell Couplings and Adapters**

SIZE AND CONNECTIONS	MANUFACTURERS MODEL NUMBER			
	MUELLER	FORD	JONES	AY MCDONALD
3/4" MIP X COPPER PACK JOINT	H-15531	L84-33	J2619	4799M-22
1" COPPER PACK JOINT X COPPER PACK JOINT	H-15526	L44-44	J2611	4761-22
1" FIP X COPPER PACK JOINT	H-15533	L14-44	----	4779-22
2" COPPER PACK JOINT X COPPER PACK JOINT	H-15526	L44-77	J2611	4761-22

**1.7 Other Brass Fittings**

DESCRIPTION	MANUFACTURERS MODEL NUMBER	
	FORD	MUELLER
1" BRANCH PIECE TEE, FIP X MIP	TSS1-444,U18-44-8	----
1" STRAIGHT CHECK VALVE, FIP X FIP	HS11-444	H-14244
ANGLE STOP	KV43-444WW	H-14258



## **SECTION 2 - DUCTILE IRON OR CAST IRON FITTINGS**

### **2.1 Adapters, Bends, Caps, Crosses, Reducers, Sleeves, and Tees**

Ductile Iron or Cast Iron fittings such as bends, tees, crosses, reducers, caps, and sleeves shall meet AWWA Standard C110 for Standard Size Fittings or AWWA Standard C153 for compact fittings. End connections shall be Mechanical Joint, Flanged, or Plain End as specified on the plans.

### **2.2 Gate Valves**

Resilient wedge gate valves, including tapping valves, shall meet AWWA Standard C509 or C515. All gate valves must open to the left.

### **2.3 Butterfly Valves**

Unless otherwise specified, all butterfly valves shall be pressure Class 150 with a manual actuator and wrench nut (2-inch square) and shall comply with AWWA Standard C504. All interior and exterior ferrous surfaces of valves shall be coated per AWWA C550.

### **2.4 Check Valves**

Unless otherwise specified, all check valves shall be resilient seated check valves in compliance with AWWA C508-01. All interior and exterior ferrous surfaces shall be coated per AWWA C550.

### **2.5 Dry Barrel Fire Hydrant Bury**

Unless otherwise specified, a 6" x 48", 6-hole, Ductile Iron, Dry Barrel Fire Hydrant Bury with Mechanical Joint Fittings shall be installed. All fire hydrants shall be Mueller Super Centurion A423 5 1/4-inch main valve with megalug flanges.

### **2.6 Fire Hydrant Check Valve**

Check valves may only be installed with wet barrel fire hydrants. The following manufacturers are acceptable:

- Mueller

### **2.7 Fire Hydrant Spools**

Break-away fire hydrant spools shall be cast iron with either 6 or 8 holes. In conjunction with the break-way spools, hollow bolts shall be installed.

### **2.8 Repair Clamps and Bands**

Repair clamps shall be of full circle all stainless steel design. The following manufacturers are acceptable:

<b>MANUFACTURER</b>	<b>ALL STAINLESS STEEL</b>
Ford	FS1/FS2
Romac	SS1/SS2
Smith Blair	261/262
Mueller	540-550
TPS	EZ-MAX 4000

## **2.9 Compression Fittings for Steel and PVC Piping**

Compression Fittings for Steel and PVC piping shall be manufactured by Total Piping Solutions – Series 6000.

## **SECTION 3 - OTHER FITTINGS**

### **3.1 Tapping Sleeves**

All tapping sleeves shall be full-circle type and comprised of stainless steel exterior band. All tapping sleeves shall include a full-circle positive seal. Tapping sleeves that only seal around the opening in the pipe are not acceptable.

The following are acceptable manufacturers for Stainless Steel Tapping Sleeves for attaching to A.C., D.I., PVC, or Steel mains (except size-on-size steel):

<b>MANUFACTURER</b>	<b>STAINLESS STEEL FLANGE</b>
Ford	Fast
Romac	SST
Smith Blair	662
Powerseal	3480AS
JCM	432

Welded Tapping Sleeves shall be used for size-on-size connections to steel mains. The following style is acceptable:

- Weld Nozzle with full wrap reinforcing pad at center line.

### **3.2 Flex Couplings, Transition Couplings, and Flange Coupling Adapters**

Flex Couplings, Transition Couplings and Flange Coupling Adapters should have a Ductile Iron Barrel and End Rings. If this is not available due to transition sizes, the coupling shall be fabricated from steel and epoxy coated inside and out. The following manufacturers are acceptable:

- Romac
- Ford
- Dresser
- Smith Blair
- TPS
- Hydro – Flex 3000 (can be used as a coupling or repair band)
- Viking Johnson or Mueller “Maxifit”

- Gradelok

### **3.3.1 Automatic Control Valves - Globe Style**

Hydraulically operated globe style automatic control valves, including Pressure Regulating Valves, Pressure Sustaining Valves and Rate of Flow Control Valves shall be manufactured by the following:

- Cla-Val Company

### **3.3.2 Automatic Control Valves - Roll Seal Type**

Hydraulically operated roll seal type automatic control valves, including Pressure Regulating Valves, Pressure Sustaining Valves and Rate of Flow Control Valves shall be manufactured by the following:

- Cla-Val Company

### **3.4 Air and Vacuum Release Valves**

Air and Vacuum Release Valves shall meet the requirements of AWWA Standard C512-04.

### **3.5 Joint Restraints**

The following joint restraint systems are acceptable:

- Ford Uni-Flange, Series 1400
- EBBA Iron Mega-Lug
- US Pipe Field Lock Rubbers

### **3.6 Expansion Joints**

The following expansion joint manufacturers are acceptable:

- Romac (Double Ball Flexijoint)
- EBAA Iron Sales (Flex-Tend)

## **SECTION 4 - PIPE AND TUBING**

### **4.1 Ductile Iron Pipe**

Ductile Iron Pipe shall meet AWWA Standard C151. Unless otherwise specified, it shall be Pressure Class 350 with push on fittings.

**4.2 PVC Pipe (C-900)**

PVC pipe size 4" to 12" shall meet AWWA Standard C900. Unless otherwise specified, 4" pipe shall be Class 200 (DR14) and 6" through 12" pipe shall be Class 150 (DR18).

**4.3 Tubing (Services)**

3/4", 1" and 2" Tubing shall be DR9. 1/4" and 3/8" shall be Refrigeration Tube.

**4.4 PVC Pipe (Sch 40 or Sch 80)**

1" and 2" PVC pipe shall be for potable water. Use Schedule 40 or 80 as specified on the plans.

**SECTION 5 - FIRE HYDRANTS & POST INDICATOR VALVES "PIVs"****FIRE HYDRANT GUIDE**

MILITARY INSTALLATION	SYSTEM(S)	FIRE DEPT.	FH TYPE	NOMINAL SIZE*	ACCEPTABLE MODEL
FORT. JACKSON	ALL AREAS	FORT JACKSON FD	DRY BARREL/ IRON BODY	6" X 4" X 2½" X 2½"	MULLER SUPER CENTURION #A423 (5¼")

FOR RESIDENTIAL AREAS, HIGHER LAND USES MAY REQUIRE MORE OUTLETS.

**POST INDICATOR VALVE "PIV" GUIDE**

MILITARY INSTALLATION	SYSTEM(S)	FIRE DEPT.	ACCEPTABLE MODEL
FORT JACKSON	ALL AREAS	FORT JACKSON FD	MULLER A423

**SECTION 6 - VAULTS, METER BOXES, AND GATE VALVE BOXES****6.1 Vaults**

The following are acceptable models of concrete/polymer vaults with torsion spring assisted metal lids.

**a. Non-Traffic Bearing**

- H & C
- Best
- Brooks
- J & R
- Bilco
- Armorcast
- Pre-Con

- Carson LLC
- New Basis

b. Traffic Bearing

- Brooks
- Bilco
- Armorcast
- Carson LLC
- New Basic

## 6.2 Meter Boxes

The following tables list acceptable models of meter boxes. Boxes listed for 5/8" and 3/4" meters are for replacement of existing boxes of the same size.

### Non Traffic Bearing

Meter Size	Minimum Meter Box ID	Manufacturer			
		Brooks	Armorcast	Carson LLC	New Basis
5/8" x 3/4"	9" x 14" (replacement only)	3MB	A6000494	N/A	WFB0914122AOC
1"	12" x 22" (new)	37MB	P6000485 A6000485 A6000485SA	MSBCF1118-12XL	WFB1220122AOC
2"	16" x 29" (new)	65MB	A6000164PCX12	MSBCF1730-12	WFB1730122AOC

### 6.2.1 Meter Lids and Covers

Meter Size	Minimum Meter Box ID	Manufacturer		
		Carson LLC	New Basis	Armorcast
5/8" x 3/4"	9" x 14" (repl. Only)	MN00109 cover	WPC0914A02A0BWM	A6000482 A6000482T (20K)
5/8" - 1"	12" x 22" (new)	MSBCF1118SPCPD cover MSCBC101 drop in lid	WPC1220B12A0AOO drop in cover WPC0509A02A0BWM drop in lid	A6000484DQ drop in cover A6000487 drop in lid A6000484 1 pc cover A6000484T 1 pc cover
1-1/2" & 2"	16" x 29" (new)	MSCBC1730RPCV16 cover MN00109drop in lid	WPC1730B22A0BOO drop in cover WPC0914A02A0BWM drop in lid	A60001643DZ drop in cover A60001947TDZ drop in cover

## 6.3 Gate Valve Boxes

The following are acceptable models of gate valve boxes:

- Brooks RT - 1
- Christie G-5
- Standard 8” C.I. Cover w/ appropriate PSUS, Inc. logo

**SECTION 7 - WATER SAMPLING STATIONS**

The following table lists acceptable models of Water Sampling Stations.

APPLICATION	MANUFACTURER	MODEL
Non-Freezing	Hydro-Guard	BSS-01 w/TCV

# **Palmetto State Utility Services, Inc.**

**A**

**Subsidiary of American States Utility Services, Inc.**

**which is a**

**Subsidiary of American States Water PSUS**

## **TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS**

Prepared by



4824 Parkway Plaza Blvd #250  
Charlotte NC, 28217  
Ph. 704-401-7257

# PALMETTO STATE UTILITY SERVICES, INC. “PSUS”

## TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS

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# PALMETTO STATE UTILITY SERVICES, INC. “PSUS”

## TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS

### SECTION 1 - GENERAL

**1.1 Scope of Work:** The Contractor shall furnish, supply, provide, assemble, have fabricated all materials, plant and equipment needed for project; provide all supervision, labor and services to carry out the project; provide all utilities and transportation, power, fuel and water, insurance, taxes, machinery, equipment (vehicles and otherwise), apparatus, tools and other means of construction; services of subcontractors and vendors, testing and restoration of paving and other existing physical conditions disturbed by the contractor’s work.

**1.2 Quality Assurance:** This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings Class 150
ANSI B16.5-88	Pipe Flanges and Flanged Fittings
ASTM A126-84	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A536-84	Ductile Iron Castings
ASTM D1248-84	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1784-90	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D2241-89	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F789	TYPE PS-46 and TYPE PS-115 Polyvinyl Chloride (PVC) Plastic Grading, Flow Sewer Pipe and Fittings
ASTM F1417	Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air
AWWA C105	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
AWWA C110	Ductile-Iron and Gray-Iron Fittings, 3 Inches through 48 Inches, for Water and Other Liquids
AWWA C111	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges

AWWA C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C600	Installation of Ductile-Iron Water Mains and their Appurtenances
AWWA C651	Disinfecting Water Mains
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches though 12 Inches, for Water
SPC	Standard Plumbing Code of the SBCCI
UPC	Uniform Plumbing Code
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
AWWA C500	Gate Valves for Water and Sewerage Systems
ASTM C478	Precast Reinforced Concrete Manhole Section
ASTM C891	Practice for installation of Underground Precast Concrete Utility Structures
ASTM D1227	Specification for Emulsified Asphalt Used as a Protective Coating for Buildup Roofing
FEDSPEC SS-S-	Sealing Compound, Preformed Plastic for Pipe Joints
	00210
AWWA C502-85	Dry-Barrel Fire Hydrants
UL 246-79	Hydrants for Fire-Protection Service

Installation of water mains and appurtenances shall be conducted in accordance with Section C of the AWWA Standards referenced above and/ or manufacturer's recommended installation procedures.

All pipe material, solder and flux shall be lead free (less than 0.2% lead in solder and flux and less than 8.0% lead in pipes and fittings).

Lubricants which will support microbiological growth shall not be used for potable water pipeline slip-on joints. Vegetable shortening shall not be used to lubricate joints.

On potable water facilities, natural rubber or other material which will support microbiological growth may not be used for any gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to the water.

**1.3 Construction Documents:** The work shall be performed in accordance with Palmetto State Utility Services, Inc. "PSUS" and/or ASUS (hereafter referred to as "PSUS") General Conditions, Supplemental General Conditions, Supplemental Conditions, these specifications, the attached PSUS plans and Standard Construction Drawings. All facilities installed under these Specifications shall be in accordance with the applicable PSUS Standard Construction Drawings unless superseded by a note or detail on the plan.

**1.4 Permits:** No construction work shall commence until all required Permits have been issued. The Contractor is to comply with all terms of the Construction/ Encroachment/ Excavation/ Right-of-Way Permit issued by the local jurisdiction(s) including

cooperating with the local jurisdiction's contractors and employees. The permit conditions shall take precedence over information shown on the plan(s) or given in the specifications. Contractor is responsible for compliance with state and local waste discharge requirements and Best Management Practices (BMPs).

In addition to any permits that the PSUS has obtained or will obtain for this project, the Contractor is obligated to obtain any additional permits required by the local agency, including providing proof of any required insurance and / or obtaining a business license and / or providing any bonding or other documents for the actual construction itself. A copy of any such additional permit is to be given to PSUS.

- 1.5 Traffic Control:** The Contractor may be required by the local jurisdiction to prepare and submit to the local jurisdiction for approval a traffic control plan. If such is required, a copy of the traffic control plan shall be filed with PSUS. The local jurisdiction may require that the traffic control plan be prepared to a specific standard. Construction must be in accordance with the approved traffic control plan.

**1.6 Local Jurisdiction Requirements:**

- 1.6.1** Unless prior written approval is obtained from the local jurisdiction(s) construction is limited to working hours per local jurisdiction's Ordinances, Resolutions and/or permit(s).
- 1.6.2** Spoils, backfill material, pipeline materials, or equipment shall not be left by the contractor on any public right-of-way job sites, without the prior written authorization of the local jurisdiction and PSUS.
- 1.6.3** All pavement striping, stop bars, legends, traffic signs, traffic control loops, or other traffic control facilities or other structures or features owned by public bodies or by private owners that are damaged or altered during construction shall be replaced as directed by the local jurisdiction or property owner.

**1.7 General Construction Requirements:**

- 1.7.1** Access to sites shall be by public right-of-ways and utility easements. Other access locations required shall be secured by the contractor at no additional expense to PSUS. Supplemental erosion control measures shall be required to include construction entrances, silt fencing, restoration, etc. Additional measures shall be included as part of a supplemental erosion control plan prepared by the contractor.
- 1.7.2** The contractor shall be required to provide the construction staging area at his expense. The contractor is expected and required to cooperate with the Fort Jackson DPW or property owners affected by the work. Private agreements with such parties must be in writing on a form approved by the engineer and a copy shall be provided to the engineer prior to proceeding with construction activities affected by said agreement. The agreement must specify that PSUS, Fort Jackson and the engineer shall be held harmless against all claims arising from the agreement. PSUS discourages private agreements. Before final acceptance, a release from each party that the contractor has made an agreement with shall be required. The property owner's release is a condition of final acceptance.

- 1.7.3 Contractor shall maintain a neat and clean job-site to include staging/storage areas as follows:
- Perform dust control by watering daily or as directed by the engineer. - sweep streets a minimum of once weekly (Friday) or as directed by the engineer.
  - Blade, level and re-compact all exposed trenches weekly (or as directed by the engineer) to produce a smooth "ride".
  - Perform daily clean-up of all dirt, debris and scrap materials.
  - Remove excess equipment, materials, tools, etc. Not needed.
- 1.7.4 Excess suitable soil excavated during construction shall be stockpiled for use on the project or disposed of off-site as directed by the engineer. The contractor shall not be allowed to stockpile materials or excess materials in the street right-of-ways at any time. The contractor shall provide a sufficient and suitable stockpile area and location at the contractor's expense.
- 1.7.5 Contractor shall provide measures during construction to secure the site and excavation from the general public and comply with all OSHA regulations. Job site safety is the exclusive and sole responsibility of the contractor. Open excavation left unattended or overnight is not acceptable and shall be filled immediately.
- 1.7.6 Contractor shall repair or replace drives disturbed by construction to existing or better conditions. No separate payment unless otherwise indicated.
- 1.7.7 Contractor shall provide temporary fencing where fences are removed for construction. Contractor shall coordinate fence removal/reinstallation with housing authorities or individual property owners prior to removal. Contractor shall reinstall all sheds, fences, etc. to as good as or better than existing conditions unless otherwise indicated (no separate payment).
- 1.7.8 Contractor shall replace all disturbed mailboxes, signs, etc. disturbed during construction within 24 hours of disturbance. Permanent road signage disturbed shall be replaced immediately and if necessary roadway signs shall be temporarily installed in a location consistent with the Fort Jackson traffic control requirements to provide continuous traffic awareness of roadway conditions (no separate payment).
- 1.7.9 Contractor shall provide security fencing, security guard, and any and all other measures contractor deems necessary to protect equipment and materials stored on the project (no separate payment).
- 1.7.10 Where contractor ceases work operations for a 72 hour period or longer, such as holidays, etc., the following shall be accomplished prior to the work stoppage. A. Contractor shall store all equipment in the contractor staging area or off site. B. The contractor shall sweep all streets, perform general cleanup and shall perform maintenance on all exposed patches.
- 1.7.11 Contractor shall schedule work and material deliveries so that stored material quantities on the job site shall be minimized.
- 1.7.12 Contractor shall store all materials in the contractor staging area 72 hours prior to incorporating into the work to reduce obstructions to traffic and inconvenience to residents. Where utilities are being constructed in easements out of traffic areas,

contractor may store materials ahead of construction for a distance not greater than 1800 feet unless approved otherwise by the engineer.

- 1.7.13 At the Fort Jackson DPW or property owner's request, the contractor shall dig up existing shrubs and bushes within utility easement to be disturbed by construction and set outside the utility easement area in a location determined by the property owner (no separate payment). Property owner will be responsible for replanting shrubs and bushes so removed, and shall be responsible for reestablishing growth. If no request is made by the property owner, disturbed shrubs and bushes shall be removed and disposed of off-site unless otherwise indicated.
- 1.7.14 Clearing and grubbing shall be restricted to permanent easements only. Contractor shall limit tree/bush clearing in the temporary easements, between houses and along property lines to only absolutely necessary for construction.
- 1.7.15 The notes contained herein are intended to supplement the technical specifications provided by the engineer and provide easy reference for the contractor. In no case shall these notes void any part, section or requirement outlined in the technical specifications contained in the contract documents. If conflicts occur between the technical specifications and the notes contained herein, the technical specifications shall supersede.
- 1.7.16 Photographs contained on drawings are for information purposes only and the contractor shall not rely on the limited number of photographs as being representative of actual site conditions. Contractor is charged with performing site investigations to ascertain existing site conditions.

## **1.8 General Utility Requirements**

- 1.8.1 Prior to commencement of any work within easements or rights-of-ways the contractor is required to notify concerned utility companies in accordance with local requirements. Contractor shall verify location of existing utilities prior to beginning construction (no separate payment). Existing utilities shown are taken from maps furnished by various utility companies and have not been physically located (i.e. Telephone, gas, cable, etc.).
- 1.8.2 The contractor shall dig up each utility which may conflict with construction 14 days in advance to verify locations (horizontally and vertically) to allow the engineer an opportunity to adjust the design to avoid conflicts (no separate payment).
- 1.8.3 All sanitary sewer & water construction shall be in accordance with standards and specifications of PSUS. Storm drainage, street construction and paving shall be in accordance with the Fort Jackson Directorate of Public Works.
- 1.8.4 Utility services to individual properties are not shown in the profiles for simplicity of the drawings. Services may include water laterals, telephone, electric, cable, gas, etc.
- 1.8.5 Contractor shall coordinate with utility owner and Fort Jackson and be responsible for temporary relocation and/or securing existing utility poles and signs and/or utilities in accordance with utility owner requirements during the utility main installation and street construction. (no separate payment).
- 1.8.6 Contractor shall provide temporary supports for utility crossings and repair damages due to construction to the satisfaction of the utility involved at no additional expense to PSUS. Underground electrical crossings shall be crossed in

accordance with the technical specification section underground electrical crossing requirements.

- 1.8.7 Where deemed necessary by the engineer that a subsurface drainage system is required, the contractor shall provide all materials, tools, labor, equipment, tie-in's to existing drainage structures and all other incidentals necessary to provide complete installation in accordance with the directorate of public works standards of Fort Jackson. Improperly installed and non-functioning drainage shall be removed and replaced at the contractor's expense. Existing french drainage damaged during construction shall be replaced and or repaired at no additional expense to PSUS.
- 1.8.8 Storm drainage repairs by contractor due to construction damage and joints exposed during construction shall be inspected by PSUS representative or engineer prior to backfilling.
- 1.8.9 All utility locations shall be coordinated, implemented, and in-place 2 weeks prior to commencement of work.

## **1.9 Traffic Control Requirements**

- 1.9.1 Contractor shall provide traffic control plans for work zone traffic control to the directorate of public works of Fort Jackson. Contractor shall not place any traffic control devices without having approval from Fort Jackson DPW (or traffic).
- 1.9.2 Contractor shall insure access to all properties by property owners and tenants/users at all times.
- 1.9.3 Contractor shall notify the directorate of public works, Fort Jackson two weeks in advance of any road closings and coordinate all road closings/utility interruptions with affected tenants/users 2 weeks prior to closing/interrupting services.
- 1.9.4 Minimum one way traffic shall be maintained at all times unless road closure is approved by the Directorate of Public Works and Fort Jackson traffic in writing 5 days in advance of road closure. An approved detour plan prepared by the contractor shall be required and the measures installed prior to closure.
- 1.9.5 Contractor shall coordinate/notify traffic services daily (before 4:00 p.m.) as to which streets will be under construction impeding traffic flow the following day.
- 1.9.6 The contractor shall not impede traffic at any time until the approved traffic control devices are in place.
- 1.9.7 All traffic control measures, devices, installation, methods, sequencing and plans shall be in strict accordance with manual of uniform traffic control devices and supplements such as SCDOT and/or Fort Jackson traffic.
- 1.9.8 Notify Fort Jackson DPW Service Order Desk at (803)-751-7684/7685 prior to beginning construction.
- 1.9.9 Work shall not begin until after the traffic control and erosion control devices have been installed to the satisfaction of Fort Jackson.
- 1.9.10 Trenching, bore pits and/or other excavations shall not be left open or unsafe overnight.
- 1.9.11 Strict compliance with the "policies and procedures for accommodating utilities on highway rights of way" shall be required
- 1.9.12 All lanes of traffic are to be open during the hours of 6:00 am to 9:00 am and from 4:00 pm to 6:00 pm. Traffic will be maintained at all times.

- 1.9.13 Any work requiring equipment or personnel within 5' of the edge of the travel lane shall require a lane closure with appropriate tapers.
- 1.9.14 During non-working hours, equipment shall be parked as close to the right of way line as possible and shall be properly barricaded so that no equipment obstruction shall be within the clear recovery area.
- 1.9.15 All roadway signs which are removed due to construction shall meet Fort Jackson standards and shall be reinstalled as soon as possible.
- 1.9.16 Excavation material shall not be placed on the pavement. Drainage structures shall not be blocked with excavation materials.
- 1.9.17 The length of parallel excavation shall be limited to the length necessary to install and back fill one joint of pipe at a time not to exceed (25) feet.

## **1.10 Wetland Construction Requirements**

- 1.10.1 Construction limits/corridor (including roads and stockpile area) to a maximum 40 foot width.
- 1.10.2 Post construction ground contours and elevations must be restored to the original elevations.
- 1.10.3 The top 6" to 12" of the trench shall be backfilled with the topsoil and/or soil existing prior to construction.
- 1.10.4 Excess material must be removed to upland areas and disposed of off-site. Temporary placement/stockpile for absolute minimum period of time.
- 1.10.5 Disturbed slopes and stream banks must be stabilized immediately upon completion of the utility line or immediately at each stream crossing.
- 1.10.6 Notify DPW Engineer and receive written approval prior to beginning construction.
- 1.10.7 Install anti-seep collars every 150 feet or as shown on plans.
- 1.10.7 No fertilizer shall be applied within 10 feet of stream.
- 1.10.8 No fresh concrete shall be in contact with streams.
- 1.10.9 Seeding shall be in accordance with the specified mixture for wetland areas.

## **SECTION 2 - MATERIALS**

- 2.1 General:** The Contractor shall furnish all of the material needed to complete the project, including supplementary materials, such as lock rings, couplings, disinfecting material, paint, resurfacing material, and concrete, unless noted otherwise on the construction plans. All material shall be per the construction plans and applicable PSUS Standard Construction Drawings. All material shall be in accordance with the latest edition of PSUS's "Potable Water Materials Guideline".

All material shall be inspected by PSUS before installation. Substitution of any material must be approved by an authorized PSUS representative.

All materials/products that contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61. The certifying party shall be accredited by the ANSI.



**2.2 Piping Materials:**

**2.2.1 Water:** See PSUS's Potable Water Materials Guideline".

**2.2.2 Wastewater:** PVC SDR 35 pipe will be used for gravity sewer pipes

**SECTION 3 – LINES AND GRADES**

**3.1 Subdivisions & Commercial Developments:** For installation of water facilities prior to curb and gutter installations, the developer shall provide all necessary line and grade stakes. The Contractor shall preserve all benchmarks, monuments, survey marks and stakes within the project area and in case of their removal or destruction by the Contractor, shall make all arrangements necessary for their replacement at their sole expense.

**3.2 Work other than Subdivisions & Commercial Developments:** For installation prior to curbs and gutters, unless noted otherwise on the plans, horizontal and vertical control points will be designated on the plans. The Contractor shall establish line and grade relative to these control points. The Contractor shall preserve all bench marks, monuments, survey marks, and stakes, and in case of their removal or destruction by him or his employees, shall be liable for the cost of their replacement.

Where indicated on plans, Contractor shall have the line and grade established by a State licensed land surveyor or engineer qualified to perform surveying.

**SECTION 4 - INSTALLATION**

**4.1 Inspection of Materials:** Factory test markings shall appear on all pipe when delivered. Field inspection shall be made to detect any damage resulting from shipment or handling, and all damaged materials shall be rejected. Pipe couplings and rubber rings shall be checked for proper diameter and size. If rubber rings show check lines because of age, they shall be rejected.

**4.2 Underground Service Alert:** The Contractor shall contact and obtain a permit from the applicable underground service alert organization at least two (2) working days (forty-eight (48) hours minimum) prior to the day of the Pre-Construction meeting.

**4.3 Potholing:** Contractor shall pothole and verify the location of all underground utility crossings noted on the construction documents prior to starting work. The Contractor's attention is directed to the possible existence of underground facilities not shown or shown in a different location from that shown on the construction documents.

**4.4 Trench Dimensions:** All trench excavations shall provide for a minimum cover of 36 inches over the top of the pipe as measured from the gutter flow line unless the cover is otherwise noted on the plans. The trench shall follow a true and straight alignment in the location shown on the plans. Any deviation necessitated by unforeseen conditions must be approved by PSUS before proceeding with the work. The width of trench excavation shall be 18 inches for pipe sizes less than 8 inches in diameter. For pipe sizes 8 inches in

diameter or larger the trench shall have a minimum width of the outside diameter of the pipe plus 12 inches but not greater than pipe OD plus 24 inches. The trench shall be excavated at a minimum of 6 inches deeper than the grade of the bottom of the pipe. Trench excavation greater than 5 feet in depth will require a Trench Safety Excavation Plan which shall comply with OSHA requirements and must be approved by PSUS before proceeding with the work.

#### **4.5 Handling of Pipe:**

- 4.5.1** Lift pipe using spreader beams that provide 3rd point lifting of pipe sections over 30 feet in length.
- 4.5.2** Employ wide belt slings for lifting pipe. Do not use cable slings.
- 4.5.3** Maintain internal bracing until pipe has been placed. Internal bracing shall be provided for all fittings.

#### **4.6 Placement of Pipe:**

- 4.6.1** Pipe laying shall include the installation and jointing of the pipe. Preparation of bedding and initial and subsequent backfill shall be as specified in Section 02200. Pipe shall be laid with uniform bearing under the full length of the barrel of the pipe.
- 4.6.2** All pipe shall be installed in strict accordance with manufacturer's recommendations, drawings and/or specifications and in the best commercial trade practice.
- 4.6.3** The Contractor shall perform all work of cutting pipe and fittings or special castings necessary to the proper and accurate assembly, erection and completion of the work. All pipe shall be cut to fit accurately with smooth edges and faces.
- 4.6.4** Any special tools required for laying, jointing, cutting, etc. shall be supplied and properly used. All pipe shall be thoroughly cleaned before laying and shall be kept clean until accepted in the completed work and, when laid, shall conform accurately to the lines and grades given. At all times during pipe laying operations, the trench shall be kept free of water.
- 4.6.5** All pipe and fittings shall be delivered in sound condition. Care shall be taken to protect exterior coatings and linings during all phases of the work. Place no material of any kind inside any piece of pipe or fitting during handling, storage or transit. Pipe and fittings shall be stored in a protected area. Use strap slings for lifting coated pipe.
- 4.6.6** Any section of pipe damaged and determined by the Engineer to be not acceptable for use shall be replaced with an undamaged section at the expense of the Contractor.
- 4.6.7** All piping systems shall be constructed from the materials shown and to the lines, grades and dimensions shown. Where not shown, the pipes shall be located to avoid interference with other features.
- 4.6.8** Bell-and-spigot pipe shall be laid with the bells upgrade. All types of piping shall be laid and fitted together so that, when complete, the pipe will have a smooth and uniform invert.
- 4.6.9** Each length of pipe laid shall be thoroughly swabbed to remove all foreign material before the next length is laid. Each pipe shall be inspected for defects before being lowered into the trench.

- 4.6.10** All piping for which no location dimensions are shown shall be installed in a neat and workmanlike manner in accordance with the best trade practice. Wherever possible, runs and rises shall be grouped and kept parallel. It shall be the Contractor's responsibility to properly lay out all piping to clear obstructions such as equipment, larger sized pipes, etc.
  - 4.6.11** Under no conditions shall the pipe be laid against the trench wall. Extra precaution shall be taken to prevent rocks or other large objects from lodging against the pipe encasement during backfill.
  - 4.6.12** In case defects are revealed by inspection, the Contractor shall replace the defective pieces and shall bear the expense. All pipe and fittings shall be carefully cleaned before laying. Precautions shall be taken to prevent foreign material from entering the pipe. Pipe shall be cut only to remove defective ends, for inserting fittings in their designated places or for closing pieces. Such cuts shall be made square with the outside edges slightly beveled.
  - 4.6.13** Depressions for pipe bells and couplings shall be hand excavated. If full bearing is not evident, the bedding surface shall be reshaped or additional bedding material added until full bearing is achieved.
  - 4.6.14** All laying operations to provide watertight pipe and pipe joints shall be the responsibility of the Contractor. If adjustment of the position of a length of pipe is required after it has been laid, it shall be removed and rejoined as for a new pipe. Prior to acceptance, the inside of the pipe shall be cleaned and all debris removed.
  - 4.6.15** Care shall be exercised to secure true alignment. The rubber gaskets shall be fitted properly in place and lubricated as necessary, and the pipe units shall be fitted together in a manner to avoid twisting or otherwise displacing or damaging the gaskets.
  - 4.6.16** All unfinished or abandoned pipelines shall be capped. Caps shall be sufficiently strong to resist backfill pressures and the superimposed loads of construction equipment. The caps shall be sealed to prevent the entrance of soil, moisture and rodents and shall be corrosion resistant. The pipe ends shall be marked in a manner approved by the Engineer.
  - 4.6.17** No change in alignment that will create air pockets will be allowed.
  - 4.6.18** Jointing materials of approved type shall be installed in strict accordance with their manufacturer's specifications. Pipe joints shall not be deflected in an amount greater than recommended by the manufacturer.
- 4.7 Bedding:** Water pipeline shall be bedded with select sand or select native soil, using full support except at couplings. Sanitary sewer pipeline shall be bedded in 1/4" to 1/2" clean crushed rock. Bedding shall be as follows:
- 4.7.1** Continuous and uniform bedding shall be provided in the trench for all buried pipe.
  - 4.7.2** Back-fill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe.
  - 4.7.3** Stones, other than crushed bedding, shall not come into contact with the pipe and shall not be within six (6) inches of the pipe.

The use of select native soil is at the discretion of PSUS's authorized representative. The cost of importing sand will be the sole cost of the Contractor. The pipe itself shall be encased with a minimum of 6-inches below and 12-inches above of sand which has a sand equivalence value of 30 or better. Coupling holes shall be of sufficient size so that the pipe may be readily assembled. Wood blocking under the pipe shall not be permitted.

**4.8 Pipe Connections:** The beveled end of any Polyvinyl Chloride (PVC) pipe shall be cut off before the pipe is inserted into a mechanical joint (MJ) fitting.

**4.9 Cutting of Asbestos Cement (AC) Pipe:** Whenever it is necessary to cut AC pipe it shall be done with the asbestos cement pipe cutter or tools recommended by the manufacturer. The use of abrasive saws will not be permitted. The cut end of the pipe shall be beveled, smooth, and free of excessive chipping.

Only the "wet-cut" method shall be applied with special emphasis on all applicable OSHA Regulations.

**4.10 Repair of Cement Mortar Lining:** The Contractor shall repair all cement mortar lining in pipe and fittings damaged. The use of hand holes is permitted where practical. Split welding collars may be used at Contractor's discretion.

**4.11 Valves:**

**4.11.1 Design Criteria:** Gate valves 3 inches through 48 inches in size shall comply with AWWA C500, including applicable hydrostatic testing. Gate valves smaller than 3 inches shall be subject to hydrostatic tests at the test pressure.

**4.11.2 Material of construction shall be as follows:**

<u>Components</u>	<u>Material</u>
<b>4.11.2.1 Body:</b>	
3 inches and smaller	Bronze
Larger than 3 inches	Cast iron, ASTM A126, Class B
<b>4.11.2.2 Wedge:</b>	
3 inches and smaller	Bronze
Larger than 3 inches	Cast iron, ASTM A126, Class B
<b>4.11.2.3 Mounting:</b>	Bronze
<b>4.11.2.4 Stem:</b>	Bronze, AWWA C500
<b>4.11.2.5 Seat rings:</b>	Bronze, Grade A, AWWA C500

Materials specified are considered the minimum acceptable for the purposes of durability, strength, and resistance to erosion and corrosion. The Contractor may propose alternative materials for the purpose of providing greater strength or to meet required stress limitations. However, alternative materials must provide at least the same qualities as those specified for the purpose.

Unless otherwise specified, bronze gate valves shall be provided with resilient seat Muller A-2361 w/Mega-lug system or approved equal.

Iron body valves shall be provided with screwed-on seat rings. Exposed gate valves shall be rising stem type. Buried or submerged gate valves shall be of the non-rising stem type. Rising stem valves and brass non-rising stem valves shall be provided with an O-ring packing. Iron body non-rising stem valves shall be provided with O-ring stem seals.

Gate valve end connections shall be flanged, mechanical joint, or threaded as specified. Threaded ends shall not be provided on gate valves with end connections larger than 4 inches. End flanges shall be integral with the gate valve body and be faced and drilled in accordance with ANSI B16.1 for 150-pound flanges.

MANUAL OPERATORS: Unless specified otherwise, valves less than 12 inch size shall be provided with hand-wheel and valves 12 inches and larger shall be provided with geared operators.

**4.11.3 Installation:** All valves, including tapping valves, shall be securely supported from underneath to prohibit settlement. Support shall consist of precast mortar blocks or concrete poured on-site, but in no case shall wood blocks be permitted as a permanent means of support. Mud and other unstable material shall be removed as necessary to permit the block to bear on undisturbed material capable of providing adequate support. Valve anchors shall be installed for all valves with mechanical joint (MJ) or Push-On joints, and when indicated on the plans, and shall be constructed in accordance with the applicable Standard Construction Drawings.

The Contractor shall leave all newly installed gate valves in the open position, unless noted otherwise, prior to final acceptance.

**4.12 Coupons:** All coupons obtained from hot tapping existing mains shall be identified by General Work Order (GWO) number and location and returned to PSUS.

**4.13 Thrust Blocks:** Adequately sized concrete thrust blocks shall be installed to counteract all thrusts created by internal water pressure during pressure testing. Thrust blocks shall be constructed in accordance with the PSUS Standard Construction Drawings thrust block requirements for the following conditions:

**4.13.1** Change of direction, as at tees and bends (vertical or horizontal).

**4.13.2** Change of size, as at reducers and at plugged crosses and tees.

**4.13.3** At flush-outs and dead-ends.

**4.13.4** Thrust at valves.

**4.14 Tracer Wire & Tape:**

**4.14.1 Tracer Wire:** – The Contractor shall provide and install tracer wire over all nonmetallic water and wastewater mains. The tracer wire shall be No. 14 gauge, solid, soft drawn insulated copper wire. The tracer wire shall be wrapped around the pipe at 10 ft. intervals and brought up inside each valve can / valve box to within 6 inches of the valve cover.

**4.14.2 Magnetic Tape:** - Polyethylene magnetic tracer tape shall be as manufactured by Allen Systems, W.H. Brady Co., Seton Name Plate Corporation, Marking Services, Inc., or equal. Tape shall be acid and alkali-resistant, 3 inches wide, 0.005 inch thick, and have 1500 psi strength and 140 percent elongation value. The tape shall be colored the same as the background colors as specified and shall be inscribed with the word "CAUTION-SEWER PIPE BURIED BELOW" for the gravity collection system and the words "CAUTION-WATER PIPE BURIED BELOW" for the water main.

Polyethylene magnetic tracer tape shall be buried 12 to 18 inches below ground and shall be above and parallel to buried nonferrous, plastic and reinforced thermosetting resin pipelines. For pipelines buried 8 feet or greater below final grade, the Contractor shall provide a second line of tape 2.5 feet above and parallel to the buried pipe.

**4.15 Gate Cans:** The Contractor shall install valve cans on all new valves installed in accordance with applicable PSUS Standard Construction Drawings. Slip cans shall be adjusted to conform to completed street surface and the Contractor shall be responsible for permanent pavement around the valve cans. The Contractor's responsibility to install and maintain valve cans at bid prices shall terminate twenty-four months after acceptance of pipe and valves. For valves to be generally left open, the cap top is to be painted blue. For valves to be generally left closed, the cap top is to be painted red. For valves on fire hydrant laterals, the cap tops are to be painted yellow.

**4.16 Services:** Services shall be installed in accordance with the applicable PSUS Standard Construction Drawings. The Contractor shall verify the location of all services with the PSUS representative and the subdivider where applicable prior to their installation. Bedding and backfill for services shall be per Sections 4.1.5 and 6.1 herein. For AC and Ductile Iron (D.I.) pipe, the insertion shall be made with a standard Type J drilling and tapping machine for drilling and tapping pipe.

For dry tapping 3/4", 1" and 2" services on PVC pipe, the hole should be bored into the pipe with a hole saw that retains the coupon and allows the shavings to fall clear of the hole. Service saddle shall be centered over the hole, seated and tightened. Then the corporation valve is installed using an approved pipe thread sealant.

The Contractor shall refer to the PSUS Service Survey Report to determine the required service work and location of the work. The Contractor shall confirm the locations with the PSUS representative.

**4.17 Fire Hydrants and Fire Services:** Fire hydrants and fire services shall be installed in compliance with the corresponding PSUS Standard Construction Drawing. Fire hydrants provided under this section shall be two-piece standpipe and stem, compression shutoff, dry-barrel type. Fire hydrants shall conform to AWWA C502 and shall be listed by Underwriters Laboratories Inc. in accordance with UL 246. Hydrants are to be equipped with 5 ¼ main valve, two 2 ½-inch hose nozzles with National Standards hose coupling

screw threads; and one 4-inch I.D. Pumper Nozzle. Nozzle caps shall have one inch square or 5-sided nuts. Nozzle cap gaskets are to be provided without chains.

- 4.17.1** The operating nut shall also be one inch square or 5-sided and the hydrant is to open by turning the nut left (counter clockwise). Top of stem shall have O-ring type seals. The color of finish paint above the ground line shall be per Standard Construction Drawing W12. Fire hydrants shall be installed as shown on the W12 drawing. Fire hydrants shall meet the factory and field test provisions of AWWA C502. An Affidavit of compliance with AWWA C502 and records of standard tests shall be provided.
- 4.17.2** The Contractor shall confirm the location with the PSUS representative and the Fire Department where applicable. Conflicts or deviations from the plans shall be brought to the attention of the PSUS representative prior to installation. Any changes in the location of fire hydrants must be approved by the applicable Fire Department.
- 4.17.3** Contractor shall provide and install a burlap sack over out of service or newly installed hydrants. This sack shall remain in place until the hydrant is placed in service.

#### **4.18 Manholes:**

- 4.18.1** Standard manholes for sanitary sewers shall be constructed of precast units. Adequate foundations for all manhole structures shall be obtained by removal and replacement of unsuitable material with well-graded granular material.
- 4.18.2** Base shall be a well-graded granular bedding course conforming to the requirements for sewer bedding but not less than 4 inches in thickness and extending either to the limits of the excavation or to a minimum of 12 inches outside the outside limits of the base section. In the latter case, the balance of the excavated area shall be filled with select material well tamped to the level of the top of the bedding to positively prevent any lateral movement of the bedding when the weight of the manhole is placed upon it. The bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the precast elements.
- 4.18.3** Precast concrete manhole sections shall conform to the requirements of ASTM C478 or C139. Cement shall be ASTM C150, Type II. Minimum wall thickness for non-reinforced sections shall be 5 inches. Minimum wall thickness for reinforced sections shall be 5 inches. Joints shall be tongue and groove mortared, rubber gasket or mastic unless otherwise specified.
- 4.18.4** The precast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment, and making sure that all entering pipes can be inserted on proper grade.
- 4.18.5** Cast-in-place bases shall be at least 10 inches in thickness and shall extend at least 6 inches radially outside of the manhole wall. Concrete shall have minimum of 4000 psi 28-day compression strength as provided in Section 03300.
- 4.18.6** The first precast section shall be placed on the cast-in-place base structure before the base has taken initial set, and shall be carefully adjusted to true grade and alignment with all inlet pipes properly installed so as to form an integral,

watertight unit. The first section shall be uniformly supported by the base concrete, and shall not bear directly on any of the pipes.

**4.18.7** Final elevation and tilt of cover shall conform to the restored street surface unless otherwise specified. Manhole castings shall be readjusted to meet uniform street grades. Warping of surfacing to meet grade of castings will not be allowed. Not less than 8 inches or more than 24 inches shall be provided between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting to street grade or ground surface.

**4.18.8** Locking manhole covers shall be required for areas of known vandalism. Contractor/designer shall consult with PSUS to determine if locking covers are required.

**4.18.9** Sealed manhole covers are required at sewer forcemain discharge manholes, sewer forcemain air vacuum/air release vaults, or wherever a high odor potential exists.

**4.19 Abandonment of Mains:** Unless noted otherwise, the following work shall be done to mains that are noted on the plans as “To be abandoned”.

1. Transfer services to live main as directed by plans and/or Service Survey Report.
2. Sever main from active facilities. Plug “live” ends with Cast Iron Plugs or other suitable material as directed by plans and an authorized PSUS representative. Plug “dead” ends with concrete.
3. Remove gate cans on abandoned pipelines. Backfill, compact, and resurface per the requirements of Section 6.

**4.20 Abandonment of Services:** Services that are to be abandoned shall be cut and plugged at the main.

**4.21 Disposal of Removed Materials:**

**4.21.1 General:** All removed materials, except those indicated on the plans or described herein to remain the property of PSUS, shall become the property of the Contractor and shall be disposed of in accordance with local, state, and federal laws. Should any of those materials be considered as hazardous the Contractor shall provide PSUS with paper custody trail documentation of the disposal. Existing facilities to be salvaged and returned to PSUS, if any, will be designated by PSUS prior to demolition and either removed by PSUS before the contractor’s work is to begin or the contractor will be directed to remove the designated item and deliver it to PSUS.

**4.21.2 Asbestos Cement (AC) Pipe Removal and Disposal:**

All efforts should be made to remove AC pipes as unbroken sections of pipe. Asbestos encapsulate spray or an equivalent shall be used on pipe ends and edges, drilled holes, and loose fragments of removed pipes.



Entire lengths of pipe should be wrapped as individual pieces. (Do NOT cut or break AC pipe into smaller pieces or sections.) Pipes shall be placed in a leak-tight material (i.e., polyethylene), wrapped in a “burrito” fashion, and sealed with duct tape. Polyethylene bags/sheets with a minimum thickness of 6 mils shall be used. Cut, broken, or cracked sections of pipe should be placed in a plastic sheet-lined drum with a lid, if possible, or wrapped and sealed in polyethylene bag.

The Following Asbestos-hazard warning labels shall be placed on all bags, packages, and containers of AC pipe.

**DANGER  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
CANCER AND LUNG DISEASE HAZARD**

AC pipe shall be disposed of in the following manner.

Manifest (Non-hazardous Waste). A written manifest shall be completed by the contractor and submitted to the transporter, if different, and landfill PSUS.

Registered hazardous waste transporters shall be contracted to transport AC pipe waste to approved landfills.

## **SECTION 5 - PROTECTIVE MATERIALS**

- 5.1 Steel Facilities:** The Contractor, as a part of his work under these specifications, shall provide cathodic protection to all exposed steel surfaces, flex couplings, repair clamps, service saddles, in all other instances in which dissimilar metals are in contact with each other installed under this contract, and to all steel surfaces exposed in the performance of this work.

Materials to be used in providing this protection shall be as follows unless otherwise specified on the Contract installation drawing:

- 5.1.1** Coal-tar primer for use under bituminous tape.
- 5.1.2.** 10 mil Bituminous tape.
- 5.1.3** Coal-tar mastic.
- 5.1.4** NSF – 61 Compliant Fusion – Bonded Epoxy Coating.

Adjacent wraps of tape shall overlap a minimum of 1/2-inch. The tape shall be applied with sufficient tension to conform to surface irregularities of the metal and existing coating, and shall be applied in accordance with the printed instructions of the tape manufacturer. The tape shall extend a minimum of one pipe diameter on either side of the exposed surface. If the integrity of the existing coating is questioned, the wrap shall be extended to those limits established by the PSUS representative.

The use of coal tar mastic as the only protective coating or lining shall be restricted to those uses where the application of tape would be exceedingly difficult and time consuming as determined by the PSUS representative. In those situations where mastic only is used, the Contractor shall take all measures necessary to protect the coating against damage during backfill operations.

- 5.2 Ductile Iron Pipe:** The Contractor shall encase Ductile Iron Pipe in Polyethylene Encasement per AWWA Standard C105, latest revision.

## SECTION 6 - BACKFILL, COMPACTION AND RESURFACING

- 6.1 Backfill and Compaction:** Backfill shall be considered as starting 12 inches above the top of the pipe. All material below this point shall be considered as bedding and shall conform to the requirements established in Section 4.1.5 herein.

All backfill installed within public right-of-way shall meet the minimum requirements of the permitting agency, hereinafter called Grantor. Minimum compaction shall be 90% in backfill and 95% in base material.

All other backfill shall be per Section 306-1.3 of the latest edition of the Standard Specifications for Public Works Construction, except rocks greater than 4 inches in any dimension shall not be permitted in the trench backfill. Where rocks are included in the backfill, they shall be well graded with suitable finer material to fill voids and provide for a homogeneous mix of material. The cost of importing any required backfill material and of hauling away spoil shall be at the Contractor's sole expense.

Compaction tests shall be required on all work unless waived by the PSUS representative. The test shall comply with ASTM D1556: Test Method for Density of Soil in Place by the Sand-Cone Method, or equivalent with respect to accuracy and acknowledged as equivalent by a licensed geotechnical engineer in the state of South Carolina. The test shall be made and certified by a State certified soils testing service. All compaction tests shall be performed as directed by the Grantor and shall be at the Contractor's expense. The Contractor shall have compaction tests performed at those locations specified by the Grantor. However, at least one test shall be performed for every 300 lineal feet of pipe installed and at least one test per job unless waived by PSUS. The location of the tests shall be determined by PSUS or Grantor.

- 6.2 Resurfacing:** The Contractor shall start placement of permanent resurfacing material as required by the Grantor but no more than seven (7) working days after the acceptance of the main installation by PSUS, and shall continue to completion. The Contractor shall notify the Grantor of their intent to place permanent resurfacing material at least 48 hours prior to resurfacing. Permanent resurfacing shall meet the requirements of the Grantor.

If not indicated on the plans, the Contractor is responsible to contact the local jurisdiction governing agency and determine the backfill and/or resurfacing requirements prior to submittal of his bid. All costs for backfill and/or resurfacing shall be included therein.

**SECTION 7 - PRESSURE TESTING – WATER & WASTEWATER SYSTEMS** Pressures, media, test durations deflections, mandrel requirements, infiltration/infiltration testing, shall be as specified in the applicable local state administrative code. Equipment which may be damaged by the specified test conditions shall be isolated. Testing shall be performed using calibrated test gages and calibrated volumetric measuring equipment to determine leakage rates. Each test gage shall be selected so that the specified test pressure falls within the upper half of the gage's range. Unless otherwise specified, the Contractor shall notify the Engineer 48 hours prior to each test. Unless otherwise specified by the bid documents, wastewater system lines shall be video logged with 2 CD/DVD copies provided to the PSUS.

## **7.1 Water Systems: Testing, Cleaning, & Flushing:**

**7.1.1 Testing:** Prior to bacteriological sampling and flushing, the Contractor shall pressure test the line under the inspection of the PSUS representative. Pressure and leakage tests must be conducted in accordance with AWWA Standards C600. The pressure must be at least 1.5 times the maximum working pressure at the point of testing for at least two (2) hours. The formula to be used for calculating the maximum allowable leakage per hour shall be:

Ductile Iron:

$$L = [SD(P)^{1/2}] \times 133,200$$

L = allowable leakage (gals./hr.)

S = length of the pipeline tested (feet)

D = diameter of pipe (inches)

P = average test pressure (psig)

PVC:

$$L = [ND(P)^{1/2}] \times 7,400$$

L = allowable leakage (gals./hr.)

N = # of joints in pipeline being tested

D = diameter of pipe (inches)

P = average test pressure (psig)

All visible leaks shall be repaired regardless of the amount of leakage. The test shall be made by placing temporary plugs or bulkheads in the pipe and filling the line slowly with water. The Contractor shall be responsible for ascertaining that all test plugs/bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe. Care shall be taken to see that all air vents are open during filling. Any piping which fails the test shall be repaired.

During the first hour, leakage shall not exceed the quantities calculated. No pressure drops shall be permitted during the second hour period. Any leaks developed or discovered under this test shall be repaired immediately, and the line shall be retested until it successfully maintains the test pressure for 2 hours without exceeding allowable leakage values calculated. Water required to fill the segment of new main for hydrostatic pressure testing shall be supplied through a temporary connection between the PSUS distribution system and the new main. The temporary connection shall include a backflow prevention device and shall be disconnected (physically separated) from the new main during the hydrostatic pressure test. The Contractor may pressure test against a newly installed closed gate valve.

Any chlorinated water resulting from leaks must be de-chlorinated to non-detectable levels before reaching catchment basins, storm drains, or natural waterways. Contractor

is responsible for compliance with state and local waste discharge requirements and Best Management Practices.

If any pipe, special fittings, valves or appurtenances fail during the test or after installation, the Contractor shall remove and replace all failed materials with appropriate new material, and correct any damages to surrounding facilities. The cost of any necessary repair shall be considered the Contractor's sole cost.

**7.2 Wastewater Systems – Cleaning, Flushing & Testing:**

**7.2.1 Cleaning:** Piping systems shall be cleaned following completion of testing and prior to connection to operating, control, and regulating or instrumentation equipment. The Contractor may, at his option, clean and test sections of buried or exposed piping systems. Use of this procedure, however, will not waive the requirement for a full pressure test of the completed system. Unless specified otherwise, piping 24 inches in diameter and smaller shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system.

**7.2.2 Flushing:** Prior to testing, all pipelines shall be flushed or blown out as appropriate. The Contractor shall test all pipelines either in sections or as a unit. The test shall be conducted in accordance with the applicable local state administrative code. The Contractor shall be responsible for ascertaining that all test plugs/bulkheads are suitably restrained to resist the thrust of the test pressure without damage to, or movement of, the adjacent pipe.

**7.2.3 Testing:** The testing of the installed pipe shall include infiltration, exfiltration or low pressure air test and deflection conducted in accordance to the applicable local state administrative code.

**7.2.3.1. Infiltration/Exfiltration** - When pipes are installed below the groundwater level, an infiltration test shall be used in lieu of the exfiltration test. This test shall be in accordance to the applicable local state administrative code.

**7.2.3.2. Low Pressure Air Test** - Prior to testing, the section of the pipeline to be tested shall be filled at a rate which will not cause any surges. After the section of pipeline has been filled, the gravity sewer shall be placed under pressure in accordance with the applicable local state administrative code between the manholes. The pipeline shall then be brought up to the test pressure specified for each pipe diameter in the applicable local state administrative code and that pressure shall be maintained on the section under test for a period of not less than the specified time shown on the table.

**7.2.3.3. Deflection Testing** - Deflection tests shall be performed on all flexible pipe. This test shall be conducted after the final backfill has been in place at least 30 days. The test and methods shall be conducted in accordance to the applicable local state administrative code.

**7.3 Wastewater Systems – Manhole Testing:** Upon completion of installation, manholes shall be tested. Test shall be either exfiltration or vacuum test, as set out below, at Contractor's option.

**7.3.1 Exfiltration Test:** Plug all inlets and outlets and fill manhole with water to a height determined by the Engineer's Representative. Allow filled manhole to stand until it has reached its maximum absorption, but not less than 2 hours. Re-establish head. Measure amount of water required to maintain test head during a

2-hour test period. Leakage as measured by this test shall not exceed 0.1 gallons per hour per foot of manhole diameter per foot of head above manhole invert (or foot of head above groundwater level, if groundwater is above manhole invert).

- 7.3.2 Vacuum Test:** Upon completion of manhole barrel installation, plug all inlets and outlets and insert rubber ring "donut" type plug in cone opening. Attach vacuum pump to hose connected to plug in cone and apply 4 psi of vacuum (install vacuum regulator on pump such that maximum applied vacuum is 10 psi). After vacuum has stabilized at 3.5 psi for 1 minute, test shall begin. During test period, manhole shall lose no more than 0.5 psi of vacuum. Specified test periods are as follows:

<b>Manhole depth,</b>	<b>Test period,</b>
feet	Min.
0-5	4.5
5-10	5.5
10-15	6.0
Greater than 15	6.5

## SECTION 8 - DISINFECTION

- 8.1 General:** As each joint of pipe is installed, it must be tilted so that all foreign material spills out of the pipe before being laid in the trench. Particular care must be exercised at all times to make certain that no foreign material enters the pipe during installation.

At the close of a day's work or whenever the workman are absent from the job, all open sections of installed pipe shall be plugged, capped or otherwise tightly sealed to prevent entry of any foreign material.

Before connection to existing mains, all new mains and repaired portions thereof or extensions to existing mains shall be flushed to clean and then chlorinated as described in the following section.

**8.2 Chlorination of Pipeline Installations:**

Disinfection of all new water mains shall be in accordance with current American Water Works Association (AWWA) Standard C651 for the disinfection of water mains. In general, one approved method referred to as "continuous feed method" is as follows:

- 8.2.1 Before being placed in service, all new mains shall be thoroughly flushed then chlorinated with not less than twenty-five (25) milligrams per liter of available chlorine.
- 8.2.2 Water from the existing distribution system or other source of supply shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine.
- 8.2.3 The solution shall be retained in the pipeline for not less than twenty-four (24) hours and then flushed thoroughly with a potable water of satisfactory bacteriological quality before starting the sampling program.
- 8.2.4 The contractor or owner shall collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction but must include all dead-end lines, be representative of the water in the newly constructed mains, and shall be collected a minimum of every 1,200 linear feet.
- 8.2.5 Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating.
- 8.2.6 These samples must be collected at least twenty-four (24) hours apart and must show the water line to be absent of total coliform bacteria.
- 8.2.7 The chlorine residual must also be measured and reported.
- 8.2.8 If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported.



8.2.9 If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated.

8.2.10 All samples must be analyzed by a State certified laboratory.

The Contractor shall provide a plan for PSUS approval which describes the chlorination process to be used, showing the location of sampling points and the sampling and disinfection equipment to be used. The use of liquid chlorine (gas) is not permitted.

Pipeline segments may be chlorinated against newly installed closed valves. Valve must be identified as closed by putting a red 2x4 in the valve can and using a red valve can lid. Water required to fill the segment of new main for disinfection shall be supplied through a temporary connection between the distribution system and the new main. The temporary connection shall include an approved backflow prevention assembly.

Flushed water must be de-chlorinated so that no water entering a catch basin or natural water way will have a detectable chlorine residual.

If subsequent disinfection processes are required, the total cost of additional re-disinfection and bacteriological testing is to be borne by the Contractor.

## **SECTION 9 – WARRANTY / GUARANTEE**

**9.1 General:** The Contractor shall guarantee all workmanship and material utilized in the installation for a period of two years from the date of acceptance of facilities by PSUS and such guarantee shall include prompt repairs of trench subsidence as may be required by the local jurisdiction governing agency. Should the Contractor fail to perform such repairs on a timely basis, PSUS may elect to perform such work itself and bill the Contractor for same.

**\*\*END OF TECHNICAL PIPELINE INSTALLATION SPECIFICATIONS\*\***

APPENDIX

MM

NOT USED

# APPENDIX

## NN

### TSC Site Circa 1939



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Friday, May 27, 2011



# APPENDIX

## OO



**Toyota-Lift  
of Minnesota**

**Toyota Lift of Minnesota**  
8601 Xylon Court North  
Brooklyn Park, MN 55445  
Phone: 763-425-9066  
Fax: 763-425-4926  
www.toyotaequipment.com

To: Department of the Army  
2169 Hwy 144 East  
Fort Stewart, GA 31314  
Attn: Charles Dunn

Date: September 10, 2008  
Our Ref: 40078487  
Phone: 912-435-8208

We respectfully submit this quotation for the following NEW Toyota Electric Lift Truck (1 each):

***Toyota...Proud to be the world's #1 lift truck manufacturer!***

**TOYOTA MODEL 7FBEU15**, 3-Wheel Sit-Down AC Electric Lift Truck, quality engineered with the following specification:

- Cushion Tires
- Electric Battery Powered

**ACTIVE MAST CONTROL (AMC)**

Toyota's industry exclusive Active Mast Function (AMC) helps reduce lift truck instability by electronically monitoring and controlling various functions of the lift truck. Should the operator inadvertently place the lift truck in a potentially unstable longitudinal condition, mast height and load sensors trigger the controller to activate the AMC, which limits forward tilt and/or tilt back speed to help reduce the likelihood of a longitudinal tip over.

**AC DRIVE & LIFT SYSTEM**

Quicker acceleration. Higher top speeds. Longer lasting power. Low maintenance. These are the hallmark benefits of the revolutionary 7FBEU electric forklift with AC Drive and Lift that distinguish it from conventional DC powered forklifts.

Simply put, Toyota's 7FBEU models are electric marvels, offering unprecedented power, performance and energy efficiency. They're the sum total of creative engineering, breakthrough design and proven technology. All driven by a single vision: to create a superior-performing electric forklift that helps boost productivity and minimize operating costs.

**MOMENTARY HOLD/CONTROLLED DESCENT**

Standard on all Toyota 7FBEU models, the Momentary Hold/Controlled Descent feature maximizes lift truck control when the accelerator pedal is released on a grade by regulating rolling speed. It also allows the lift truck to be started on an inclined surface without rolling backwards.



*Photo may portray optional equipment not included in your quotation.*

**AUTOMATIC FORK LEVELING**

Toyota's Automatic Fork Leveling feature increases productivity while reducing damage with a push of a button. By depressing the Automatic Fork Leveling button during forward tilt, operators are quickly and easily able to level the forks.

---

**Mast** 3-Stage (FSV) mast with full free lift provides excellent visibility to load and fork tips, while providing smooth, quiet and consistent operation. Mast specifications:  
 Maximum Fork Height - **189"**  
 Overall Lowered Height - **83.5"** (Overhead Guard Height - **78.00"**)  
 Free Lift - **35.4"** with standard Load Backrest

---

**Lifting Capacity** **Base Model Capacity - 3,000 lbs. @ 24" load center**  
**Actual Capacity, based on quoted specifications, - 2,600 lbs. @ 24" load center to 189" MFH**

*Actual capacity ratings stated above are based on standard features, options, and attachments available through Toyota at the time of quoting. Non-standard features, options, and attachments may affect actual capacity ratings. Please contact your Toyota sales representative for additional information.*

**Tilt** 5 degrees forward and 6.5 degrees backwards

**Carriage** ITA Hook-type, 36" Carriage

**Forks** **Forks 42" x 4" x 1.4" Class II**

**Load Backrest** 48" High

**Attachments** **Cascade 36" Sideshifter (Includes 3rd Function Hosing)**

**Speeds** Travel Speed: 9 mph. Lift Speed: 89 fpm.

**Voltage** 36 Volt electrical system

**Steering** On-Demand Hydrostatic Power Steering with Memory Tilt Steering Column

**Battery Compartment** 21.7" (L) x 39.2" (W) x 24.1" (H)

**Wheels and Tires** Front Tires: 18x7x12-1/8  
 Rear Tires: 15x5x11-1/4

**Additional custom Equipment** **Backup Chime**  
**3-stage mast with sideshifter and 42" forks**  
**Maintenance free Libra battery and matching charger (208-240 or 480 1 or 3 phase input)**

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- Other**
- Regenerative Braking
- Outstanding**
- On Demand, Full Hydraulic Power Steering
- Toyota Features**
- Thermal Protection Indicator
  - Operator Presence Sensing System (OPSS)
  - Travel Power Control (programmable acceleration)
  - Planned Maintenance Indicator
  - Dual Action Hand Parking Brake
  - Adjustable Headlights with Guards
  - Electronic Shift Control
  - Memory Tilt Steering Column
  - Dual Operator Assist Grips
  - Dash Integrated Pen/Pencil/Cup Holder
  - Durable Rubber Floor Mat
  - Dash Mounted Cup Holder
  - Digital Multifunction Display

**Warranty** 12 Months or 2,000 hours whichever occurs first: Basic  
 24 Months or 4,000 hours whichever occurs first: Powertrain

*We offer a Toyota factory authorized warranty on all new Toyota Industrial Equipment.*

<b>Investment</b>	Price-Toyota Model 7FBEU15 as specified above:	\$14,322	Each
	Custom equipment above and delivery	10,759	
	Net Price:	\$25,081	Each

**Financing and Maintenance** A broad range of competitive and flexible financing options are available through Toyota Financial Services. Financing requires credit approval. Terms and conditions are subject to change.

In addition, Full Maintenance and Planned Maintenance programs are available.

**Terms and Conditions**

Payment: Net 30 days / Cash or Financed  
 Delivery: Will advise at time of order.  
 F.O.B.: Delivered  
 Prices are exclusive of any sales or use taxes now in force or which may be made effective in the future by any federal, state, or local governments  
 Performance and specifications stated are based on specific testing and operating conditions. Actual performance and specifications may vary based on application, option configuration, operating conditions, and environmental factors.  
 Some options and configurations may void UL.  
 Conditions subject to change to those in effect at time of delivery.  
 Your signature on this proposal constitutes an order.  
 Please contact your Toyota sales representative for additional information.













# APPENDIX

## PP



# **FORT JACKSON**

## **LAND DISTURBANCE HANDBOOK**



**FIRST EDITION**  
**JULY 2004**

**Prepared for Fort Jackson Directorate of Logistics and Engineering – Environmental and Natural Resources Division (DLE-ENRD) in accordance with South Carolina Regulations and the USEPA NPDES Stormwater Program**

**Prepared by:**



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## ACRONYMS

BMP	Best Management Practices
BSDP	Best Site Design Practices
CWA	Clean Water Act
ECB	Erosion Control Blankets
EPSC	Erosion Prevention and
FEMA	Federal Emergency management Agency
LID	Low Impact Development
MEP	Maximum Extent Possible
MOI	Memorandum of Instruction
MS4	Municipal Separate Storm Sewer System
NOI	Notice of Intent
NOW	Notice of Work
NPDES	National Pollutant Discharge Elimination System
PCA	Pollution Control Act (South Carolina 1970)
SCDHEC	South Carolina Department of Health and Environmental Control
SMSRA	Storm Water Management and Sediment Reduction Act (South Carolina 1991)
SPP	Spill Prevention Plan
SWMP	Storm Water Management Plan
TRM	Turf Reinforced Mat
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

# EXECUTIVE SUMMARY

## Purpose

The purpose of the handbook is to educate potential engineers, architects, contractors and any others in the manner in which land development activities will be conducted. The main focus of the handbook is the proper control of runoff in terms of quantity and quality. Details of the submittal and permitting process are also provided.

## Need for the Handbook

The handbook will provide consistency in plan submittals that are part of any land disturbance activity as well as address some of the issue that Fort Jackson faces under the NPDES General Permit SCS0000000 requirements. Fort Jackson has obtained the equivalent of delegated review responsibilities from SCDHEC for land disturbance activities, and this handbook will assist reviewers and planners for Fort Jackson with the design that will simplify the process for complying with the NPDES permit and ensuring the protection of lands.

## Organization

This handbook is sectioned into the following chapters:

Chapter 1 – Introduction: Covers the broad perspective on why and how this handbook was created. Details on the history of the NPDES program and compliance issues are discussed.

Chapter 2 – Storm Water Management Requirement and Standards: Lists all of the requirements that are to be in any submittal package for land disturbance activities.

Chapter 3 – Plan Submittal and Design Requirements: Provides the submittal process and the types of information that Fort Jackson requires in any submittal package for land disturbance activities. These include design specifics for storm sewer, erosion control, BMPs, culverts, detention ponds, or other structural portions of the drainage system.

Chapter 4 – References: Lists all references used or mentioned in the handbook. These include documents that provide greater detail on methodologies, the NPDES program, BMPs design, and many others.

## Limitations

This handbook was not intended to be a single source document for performing the required civil engineering calculations that will be necessary to comply with the land disturbance requirements of Fort

Jackson. Instead, the information will provide many of the inputs required for those calculations. The reason for this approach was to simplify the process. For example, including information on how to calculate a peak flow, which is fully documented and available, is redundant and inefficient. The Reference section provides links to this and many other types of information.



# 1.0 INTRODUCTION

## 1.1 Purpose of the Handbook

The purpose of the Fort Jackson Land Disturbance Handbook is to provide engineers, plan reviewers, inspectors, and contractors involved in land development within the boundaries of the United States Army Basic Training Facility at Fort Jackson with the following information:

- Land disturbance requirements;
- Storm water management requirements;
- Summarization of the permit application submittal requirements and approval process; and
- Guidelines for designing, implementing, and maintaining storm water best management practices (BMPs) and low-impact development (LID) techniques to
- improve water quality, prevent illicit discharges, and minimize storm water runoff impacts due to increased flow volumes and peak discharge rates from developed areas.

This Handbook has been prepared in accordance with NPDES Phase II General Permit No. SCS00000000 and the South Carolina Storm Water Management and Sediment Reduction Act to accomplish the following objectives:

- Reduce storm water impacts on water quality;
- Reduce storm water impacts on water quantity;
- Protect downstream areas from adverse storm water impacts resulting from development;
- Identification of required content for and format of storm water plan submittals and plan reviews; and
- Submittal of high quality storm water design plans from the design community.

This Handbook has been prepared under the direction of Fort Jackson, which has been granted the authority to administer the stormwater management and sediment control plan review, approval/disapproval, and inspection by South Carolina Department of Health and Environmental Control (SCDHEC). By satisfying the requirements outlined in this Handbook, the resulting design is considered to be in compliance with the provisions of the Stormwater Management and Sediment Reduction Act of 1991.

## **1.2 Description and Use of the Handbook**

The Handbook was developed under the assumption that the user possesses a basic understanding of storm water control design, construction, or land development depending on the users particular area of expertise. The Handbook provides those groups and others with required information for and proper formatting of submittal packages on proposed land disturbance activities on Fort Jackson. Users of this Handbook who are not justly qualified by education or experience in the fields of storm water control design, construction, or land development should consult with a qualified professional in one or more of these areas prior to planning for land disturbance activities.

This Handbook is not intended to be a systematic design methodology that addresses every land development situation that may occur on Fort Jackson nor is it a detailed reference for the various methods and procedures used in the design process. The application of engineering principles and judgement combined with the information contained within this and other referenced material are necessary to successfully complete the planning, design, and preparation of documents for storm water management plan submittal. References to guidance documents from federal, state, and local agencies are given throughout the Handbook to provide additional information to users.

This Handbook is not intended to restrain or inhibit engineering creativity, freedom of design, or the need for engineering judgement. When shown to be applicable, it is encouraged that new procedures, techniques, and innovative storm water BMPs be submitted with supporting documentation. However the use of such approaches should be substantiated with submitted documentation by design professionals showing that proposed design is equal to, or exceed the traditional procedures in terms of performance and economic feasibility.

## **1.3 Design Handbook Organization**

The Handbook contains four chapters. A general Table of Contents is found at the beginning of the Handbook. This Handbook is organized to present recommended technical and engineering procedures along with the criteria needed to comply with the State of South Carolina's Storm Water Management and Sediment Reduction Act and NPDES Permit No. SCS000000. Each chapter of the Handbook presents information on each aspect of storm water management that could be encountered during land disturbance activities.

## **1.4 Updates to the Design Handbook**

This Handbook is intended to be a dynamic document. As design technology and criteria evolve, the Handbook will be updated.

## **1.5 The Need for Storm Water Management**

Development has the potential to alter the natural drainage patterns and flow rates and volumes of water in the environment. Development changes the physical, chemical, and biological conditions of natural waterways. When land is developed, the natural hydrology of the

watershed is disrupted and traditional systems have facilitated the efficient removal of not just runoff, but associated pollutants into receiving waters. Clearing removes vegetation that intercepts and slows rainfall runoff. Grading removes beneficial topsoil, compacts the subsoil, and fills in depressions that provide natural underground storage. As a result of land development, infiltration is decreased and rainfall that once seeped into the ground runs off the surface at an accelerated rate.

### **1.5.1 Effects of Development on Watershed Hydrology**

Development and urbanization have the following impacts on receiving waterbodies:

- Changes to Stream Flow
  - Increased runoff volumes
  - Increased peak runoff discharges
  - Greater runoff velocities
  - Increased flooding frequency
  - Lower dry weather flows (base flow)
- Changes to Stream Geometry
  - Stream channel enlargement and erosion
  - Stream downcutting
  - Changes in channel bed due to sedimentation
  - Increase in floodplain elevation
- Degradation of Aquatic Habitat
  - Degradation of habitat structure
  - Decline in stream biological functions
- Water Quality Impacts
  - Reduced oxygen in streams
  - Microbial contamination
  - Hydrocarbons and toxic materials
  - Sedimentation
- Property Damage and Safety Concerns
- Unsightly Aesthetic Stream Channel Conditions

### 1.5.2 Innovative Design Approach

When designing for land disturbance activities, the design should consist of five categories: maximum water quantity (flood control), design storm rainfall depth and/or intensity (design conditions), erosion prevention, sediment control, and water quality benefits. If an innovative storm water design approach is to be used, the design professional should take the following considerations in mind:

- Storm water quantity and quality are best controlled at the source of the problem by reducing the potential maximum amount of runoff and pollutants; and
- Best site design techniques implement storm water management by using simple, nonstructural methods along with or in place of traditional storm water management structures when applicable.
- Equaling or exceeding traditional stormwater management designs in terms of performance (rate/volume attenuation, pollutant removal) and economic feasibility (long-term) are essential to a proposed concept's eventual approval.

Innovative approaches to site design are more of a source control for storm water runoff – the site design practices limit the amount of runoff generated as well as use certain BMPs within the design. These types of design concepts are described in detail in several sources including: **Georgia Storm Water Handbook, Volume 1: Policy Guidebook**, First Edition, Atlanta Regional Commission, August 2001; and, **Low-Impact Development Design Handbook**, Prince George's County Maryland (1999a, 1999b). Some general concepts from these sources are provided in the following Sections.

### 1.5.3 Best Site Design Practices and Site Planning Process

The first step in addressing storm water management begins in the site planning and design stage of the development project. By implementing Best Site Design Practices (BSDPs) during the site planning process, the amount of runoff and pollutants generated from a site can be reduced by minimizing the amount of impervious area and utilizing natural on-site treatments. The minimizing of adverse storm water runoff impacts by the use of BSDPs and site planning should be a major consideration for a design professional.

The reduction of runoff volumes and storm water pollutants reduces the total number and size of storm water management controls that must be implemented under the guidelines set forth in this Handbook. BSDPs reduce the amount of total post-development impervious areas and maintains natural characteristics of the pre-development site conditions. Therefore, the post-development curve number and time of concentrations are maintained more closely to the pre-development conditions. This reduces the overall hydrologic and hydraulic impact of the development.

### **1.5.3.1 Maintaining site resources and natural undisturbed areas**

Conservation of site resources and natural undisturbed areas helps to reduce the post development runoff volume and provide areas for natural storm water management. Some natural site resources that should be maintained include, but are not limited to:

- Natural drainageways,
- Vegetated buffer areas along natural waterways,
- Floodplains,
- Areas of undisturbed vegetation,
- Low areas within the site terrain,
- Natural forested infiltration areas, and
- Wetlands.

### **1.5.3.2 Lower impact site layout techniques**

Lower impact site layout techniques involve identifying and analyzing the location and configuration of structures on the site to be developed. Where applicable, the following options that create lower impacts layouts should be used:

- Fit the design layout to follow the natural contours of the site to minimize clearing and grading and preserve natural drainage ways and patterns.
- Limit the amount of clearing and grading by identifying the smallest possible area on the site that would require land disturbance.
- Place development areas on the least sensitive areas of the site.
- Utilize nontraditional designs to reduce the overall imperviousness of the site by providing more undisturbed open space by minimizing clear-cutting.

### **1.5.3.3 Reduction of impervious cover**

The reduction of total impervious area directly relates to a reduction in storm water runoff volume and the associated pollutants from a development site. The amount of impervious cover on a site can be reduced by the following techniques where applicable:

- Reduce building footprints by requiring some buildings to be multi-story.
- Reduce parking lot areas and/or the use of porous paver surfaces for desired overflow parking.

- Increase the amount of vegetated parking lot “islands” that can also be utilized for storm water management practices such as Bioretention areas.

#### **1.5.3.4 Utilization of natural features for storm water management**

Traditional storm water drainage design does not utilize the natural drainage patterns of the site from the pre-developed state. Structural storm water drainage controls are traditionally designed to quickly remove storm water runoff from the site without utilizing any of the natural storage areas. These natural drainage areas should be considered as potential storm water drainage systems. These natural areas can be utilized in the following ways where applicable:

- Vegetated buffers and undisturbed areas on the site are useful to control sheet flow (not concentrated flows) by providing infiltration, runoff velocity reduction, and pollutant removal.
- Various natural drainageways should be maintained and not disturbed to provide a natural storm water drainage system to carry runoff to a natural outlet. The use of natural drainageways allows for more storage of storm water runoff, lower peak flow rates, a reduction in erosive runoff velocities, and the capture and treatment of pollutants.
- Use vegetated swales instead of curb and gutter applications where applicable. This application allows for more storage of storm water runoff, lower peak flow rates, a reduction in erosive runoff velocities, and the capture and treatment of pollutants which does not occur with curb and gutter systems.
- Where ditched roadways are not practicable, curb and gutter systems may be combined with vegetated swales at outfalls to provide added water quality benefits versus the traditional piped outfall designs.
- When applicable, direct rooftop runoff to pervious natural areas for water quality treatment and infiltration instead of connecting rooftop drains to roadways and other structural storm water conveyance systems.

#### **1.5.3.5 Engineered/proprietary devices**

Fort Jackson is aware of the potential benefit in using a number of engineered devices currently available on the market, such as treatment devices such as baffle boxes, cartridge filters, bioretention, erosion control devices such as socks and tubes, and advanced vegetation producing methodologies. Fort Jackson will evaluate any and all such devices specified for a given product and require for each appropriate drawings, specifications, and discussions as to the applicability of the product, expected performance, and required maintenance. Fort Jackson reserves the right to request that certain devices be installed.

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## **1.6 Storm Water Management Regulations and Policies**

To address the adverse impacts of urbanization and land development, Federal, State and Local regulations have been adopted to protect the quantity and quality of the runoff received by the natural receiving waterbodies.

### **1.6.1 Storm Water Related Regulations and Permits**

With the mandate of the Clean Water Act, the United States Environmental Protection Agency (USEPA) stated that it is illegal to discharge any pollutant to the “Waters of the United States” without a NPDES Permit. The various types of NPDES storm water permits are described below.

#### **1.6.1.1 Clean Water Act**

The Federal Clean Water Act (CWA) requires that discharge permits, called National Discharge Elimination System (NPDES) permits, be obtained for every point source discharge of wastewater. The 1987 amendments to the CWA also required NPDES permits for industrial discharges, including storm water runoff associated with land disturbing activity (typically land development and construction) of five (5) acres or greater. The threshold five-acre area was challenged and the federal NPDES regulations were amended in accordance with a court order for storm water discharges in December 1999. These amendments lower the acreage for when an NPDES permit is required for construction or land clearing to one (1) acre while allowing a case-by-case determination for sites less than one (1) acre.

The 1987 CWA Amendments also require NPDES permitting for storm water runoff from urbanized areas. A municipal separate storm sewer system (MS4) NPDES permit is required based on population. MS4s are divided into three categories: large (250,000 or greater); medium (less than 250,000 but equal to or greater than 100,000); and small (greater than 50,000). The implementation schedule for these MS4 permits has been repeatedly delayed. All permits are now in the process of being implemented.

For both the land disturbing and MS4 non-point source permits, preventing the pollution at the source through the use of Best Management Practices (BMPs) is the preferred and most practical method. Additional BMPs can be used as needed to address capture, control, and treatment of pollutants after they have been generated or released from a source area. Authority to administer the NPDES permit program was delegated to SCDHEC in accordance with the CWA by the USEPA.

#### **1.6.1.2 South Carolina Pollution Control Act**

The South Carolina Pollution Control Act (PCA) S.C. was originally enacted in 1950 and was last amended in 1970 during the initial stages of the environmental movement. It was written very broadly and is applicable to essentially any activity.

The most important provision of the statute is Section 48-1-90, it states that it is “unlawful for any person, directly or indirectly, to throw, drain, run, allow to seep or otherwise discharge into the environment...[any] wastes, except as in compliance with a permit” issued by SCDHEC.

### **1.6.1.3 South Carolina Storm Water Management and Sediment Reduction Act**

The South Carolina Storm Water Management and Sediment Reduction Act of 1991 (SMSRA) S.C. Code Ann. §§ 48-14-10 et seq. was enacted to address the increase in storm water runoff rate and quantity, the decrease of rainwater infiltration, and the increase in erosion associated with the extensive urban development that has been occurring throughout the state. Fort Jackson has the authority to implement the requirements of this Act and its associated regulations.

### **1.6.1.4 NPDES Permit for Storm Water Discharges Associated with Industrial Activity**

All storm water runoff from “industrial activities” is considered an illegal discharge without an NPDES Storm Water Permit (SCR100000). These permits require certain industries to develop and implement a Storm Water Pollution Prevention Plan (SWPPP), which must include appropriate BMPs to minimize pollution to the receiving natural waterbodies. There are two general types of industrial activity permits: “construction related” and “other”. A NPDES storm water permit for storm water discharges from construction sites is required for all construction sites that disturb one (1) or more acres of land. The requirements for obtaining and complying with this type of permit are covered within this Handbook.

### **1.6.1.5 NPDES General Permit SCS0000000**

Fort Jackson is required to comply with the NPDES General Permit for storm water discharges. This permit was issued by SCDHEC in accordance with the provisions of the Stormwater Management and Sediment Reduction Act of South Carolina (S.C. Code Sections 48-14-10 et seq., 1976) and with the United States Clean Water Act (P.L. 92-500), as amended, 33 U.S.C. Section 1251 et seq. The Memorandum of Instruction (MOI) defines compliance of this permit. The permit requires that Fort Jackson develop and implement a Storm Water Management Program (SWMP) to control the discharge of pollutants from its MS4 to the maximum extent practicable (MEP).

Fort Jackson has been granted the authority to administer the stormwater management and sediment control plan review and approval/disapproval, and the inspections during construction and maintenance inspection components of the South Carolina Stormwater Management and Sediment Reduction Program to handle the following responsibilities:

- Comply with all Federal and State regulatory requirements imposed by the NPDES Permit in accordance with the Clean Water Act to manage storm water discharges from Fort Jackson.
- Conduct all activities necessary to carry out the storm water management programs and other requirements included in the NPDES General Permit, SCS0000000.



- Maintain the storm water system consistent with provisions of NPDES General Permit, and pursue the necessary means and resources required to fulfilling this responsibility.
- Direct and oversee the continuous implementation and direct and ensure compliance with the NPDES General Permit.

As of July 1<sup>st</sup>, 2004, the NPDES General Permit SCS00000000 is in litigation within the State courts of South Carolina. Fort Jackson has continued the process of complying with this permit in a timely and necessary manner.

A copy of the MOI can be found in Appendix A.

## 1.7 Contact Information

The following Fort Jackson personnel should be contacted for any questions, clarifications, or other information not in this handbook.

Primary Contact:

Doyle Allen  
Soil Conservationist  
ATZJ-DLE-PSW  
Fort Jackson, SC  
(803) 751-7232  
(803) 751-6821 (fax)  
[allend@Jackson.army.mil](mailto:allend@Jackson.army.mil)

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## **2.0 STORM WATER MANAGEMENT REQUIREMENTS**

### **2.1 Overview**

This chapter presents a set of minimum requirements and standards for storm water management for development within the boundaries of Fort Jackson, South Carolina. The purpose of the minimum requirements and standards is to reduce the impact of storm water runoff on receiving waterbodies downstream from land development. The goal of this chapter is to address both water quantity and water quality requirements and standards associated with storm water runoff from land development. The requirements discussed in this chapter are based on the South Carolina Department of Health and Environmental Control (SCDHEC) and Federal storm water regulations discussed in the previous chapter. Consistency with Richland County and the SC Department of Transportation stormwater system designs was established in the development of these requirements.

### **2.2 Minimum Requirements for Development**

#### **2.2.1 Applicability**

Storm water management minimum requirements and standards apply to all land disturbance within Fort Jackson that consists of one or more of the following:

- All development that involves the disturbance of one (1) acre of land or greater;
- Redevelopment that involves the disturbance of one (1) acre of land or greater;
- Any commercial or industrial development that falls under the NPDES Industrial Storm Water Permit; and,
- Development that creates a peak flow increase of greater than one cubic foot per second (1 cfs).

As a general requirement for submittal purposes, all land disturbance activities that fall under these provisions shall require the following as necessary:

- Completed Fort Jackson Application Form for Land Disturbing Activities,
- Completed Fort Jackson Land Disturbance Submittal Summary Form.
- Construction drawings, and
- Technical Report.

##### **2.2.1.1 Fort Jackson Application Form for Land Disturbing Activities**

The Application Form shall be completed and contain certification by the person responsible for the land disturbing activity that their actions will be accomplished pursuant to the approved plan and that responsible personnel will be assigned to the project. A copy of the application form can be found in Appendix B.

### **2.2.1.2 Fort Jackson Land Disturbance Submittal Summary Form**

This sheet allows submitters to enter all information from the technical report in a summarized format that will aid reviewers from Fort Jackson by providing a comprehensive glance at the land disturbance activities and associated storm water management plan that is being proposed. All information inserted into this form should be substantiated with detailed calculations, which are to be placed in the Technical Report section.

This form contains sections corresponding to hydrology, hydraulics, storm sewer design, BMP design, including detention ponds, erosion control design, and maintenance schedules. A blank form is given in Appendix C.

### **2.2.1.3 Technical Report**

The technical report contains all of the engineering details of the proposed development project in an understandable, legible document. Failure to provide all the information required in this section may result in the denial of receiving approval from Fort Jackson and coverage under the General Permit. The items listed as the technical report submission requirements shall be used as a checklist to verify that all required items are properly submitted.

Possible sections of the technical report include, but are not limited to:

- Watershed information,
- Hydrologic information,
- Storm sewer design information,
- Channel design information,
- Erosion Prevention and Sediment Control (EPSC) plans design information,
- Detention/Retention facilities design information,
- Water quality/BMPs design information,
- Outlet velocities, and
- Maintenance schedules.

The details of requirements for each of these topics are provided in the following chapters

## **2.2.2 Exemptions**

The following development activities within the fort shall be exempt from the minimum regulations and standards:

- Development that does not disturb more than one (1) acre of land.
- Development that does not create a peak flow increase of greater than one (1) cfs.

- Land disturbing activities on agricultural land for production of plants and animals useful to man.
- The construction of agricultural structures of one or more acres, such as broiler houses, machine sheds, repair shops and other major buildings which require the issuance of a building permit shall require the submittal and approval of a Storm Water Management Plan.
- Customary and routine grounds maintenance, landscaping, and home gardening which does not require a zoning use exception or building permit, and does not affect storm water drainage entering or leaving any public right-of-ways.
- Land disturbance activities undertaken on forest land for the production and harvesting of timber and timber products.
- Land disturbing activities that are conducted under another State or Federal environmental permitting, licensing, or certification program where the State or Federal environmental permit, license, or certification is conditioned on compliance with the minimum standards and criteria developed under this Handbook.
- Any land disturbing activities undertaken by any entity that provides gas, electrification, or communication services, subject to the jurisdiction of the South Carolina Public Service Commission.
- Emergency repairs of a temporary nature that are necessary for the preservation of life, health, or property and are made under circumstances where it would be impracticable to obtain a Storm Water Management Permit.

### **2.2.3 Spill Prevention Plans**

A spill prevention plan (SPP) may be required depending on the specifics of the project and the discretion of Fort Jackson personnel. The submittal requirements for SPPs will be issued as necessary. US EPA provides information on SPPs on the Office of Wastewater Management website ([www.epa.gov/owm](http://www.epa.gov/owm)).

## **3.0 PLAN SUBMITTAL AND DESIGN REQUIREMENTS**

This chapter provides the user with the information requested by the Fort Jackson concerning land disturbance activities. A discussion of the recommended storm water management planning process is followed by the details of the Storm Water Management Planning, the submittal, review and approval processes, design standards, technical requirements, and contractor-related requirements.

### **3.1 Storm Water Management Planning**

#### **3.1.1 Purpose**

The purpose of Storm Water Management Planning is to ensure that storm water management is considered and fully integrated at the planning stages of the site-development process. This involves a more comprehensive approach to site planning and a thorough understanding of the physical characteristics and resources associated with the project site. Site designers are encouraged to develop comprehensive Storm Water Management Plans (SWMP) for proposed development. This planning includes addressing each of the following categories separately:

- Storm water quantity controls,
- Erosion and sediment control,
- Storm water quality controls, and
- Storm water conveyance controls.

The result of this planning is a comprehensive report that contains technical information and analysis to submit to the Fort Jackson to determine if the proposed development meets the storm water regulations and the standards of the State of South Carolina and the United States Government. Details of state laws concerning storm water were discussed in section 1.6.

#### **3.1.2 Steps for Successful Storm Water Management Plans**

The design of successful storm water management plans involves adhering to the following requirements where applicable:

- Pre-submittal site meeting,
- Review of site development requirements,
- Detailed site analysis,
- Creation of a Storm Water Concept Plan, and
- Design aspects of the SWMP,

- Approval and completion of the SWMP → Final SWMP.

### **3.1.2.1 Pre-submittal site meeting**

One of the more important actions that can take place at the beginning of the land-development process is a pre-submittal meeting between Fort Jackson, design professional, and contractor. This meeting may take place at the actual site to be developed. This meeting allows all of the entities involved in the land development process to understand the storm water management requirements and identify the areas on the site that will require the most attention to meet the requirements of the regulations. Major incentives for the pre-submittal site meeting are establishing a partnership between all of the entities involved through the entire development process, and increasing the chances of expedited approval through an early understanding of the permitting and plan requirements. It shall be left to the discretion of Fort Jackson if this meeting shall or shall not be required for a specific project.

### **3.1.2.2 Review of site development requirements**

The SWMP design professional should be familiar with the South Carolina storm water management requirements (see section 1.6). All other information and guidance can be obtained from this Handbook and the pre-submittal meeting.

The plan design professional must also be familiar with other local requirements and ordinances such as, but not limited to the following:

- Road and utility requirements,
- Land development regulations,
- Floodplain management ordinances, and
- Other Local, State, and Federal regulatory requirements and regulations.

### **3.1.2.3 Detailed site analysis**

To better understand the existing topography, hydrology, and hydraulics of the proposed development, the design professional should personally make a field site visit. During this visit, the design professional should collect as much information as necessary to create an accurate existing condition map of the proposed site. An understanding of the existing site conditions should result in the implementation of a SWMP that will effectively control stormwater runoff quantity and quality from land disturbance impacts. An actual site visit also gives the design professional an initial vision of how the potential storm water management system can fit with the surroundings and project expectations.

Items to be recorded during the site visit shall include, but are not be limited to the following:

- Topography of the site especially very steep sloped areas,
- Natural drainage patterns, swales, and detention areas,

- Natural perennial flowing streams and intermittent streams,
- Existing floodplain locations and elevations,
- Soil types and evidence of eroded and/or non-eroded soils,
- Existing vegetation including the corresponding density of each type of vegetation, including:
  - trees,
  - grasslands, and
  - various ground covers,
- Existing development including roads, buildings, utility easements, parking areas, and ponds,
- Existing storm water facilities including ditches, storm sewer systems, and detention ponds,
- Adjacent property characteristics and storm water outfall points,
- Wetlands,
- Critical habitat areas,
- Boundaries of existing wooded areas, and
- Existing buffer areas along natural drainageways and channels.

#### **3.1.2.4 Creation of a Storm Water Concept Plan**

The Storm Water Concept Plan involves the overall layout of the site including the storm water management system layout. This Concept Plan gives the design professional the opportunity to propose several potential site layout possibilities to Fort Jackson. The submittal of this plan is the first step in obtaining approval from Fort Jackson.

The following steps should be followed when developing the Storm Water Concept Plan:

- Based on the review of the existing site conditions, use the appropriate best site design approaches. This will minimize the size and number of water quantity and water quality controls needed to comply with the State and Federal storm water management requirements;
- Discuss all modeling methodologies to be used;
- Calculate the preliminary water quantity and water quality control volumes to comply with the NPDES General Permit requirements;

- Perform preliminary selections and potential locations of all water quantity and water quality controls including storm water conveyance systems and erosion and sediment control structures;
- Determine an estimate of all costs for construction and engineering.

It is very important that a Storm Water Concept Plan is integrated into the overall site design process and is not the last topic covered before submittal of the permit package. If necessary, the application of a Concept Plan should expedite the final design process and review process to obtain land disturbance and, if necessary, NPDES permits.

To achieve maximum benefits, the Storm Water Concept Plan should include at a minimum the following elements when applicable:

- Site location and description of the site,
- Narrative description of existing and proposed drainage patterns and facilities,
- Vicinity map of the project location,
- Existing conditions and proposed development plan having at least the following items:
  - existing and proposed contours,
  - perennial and intermittent streams,
  - predominant soil types and their locations from USDA soils maps or soil samples (a soil map of Fort Jackson is provided in Appendix E),
  - watershed delineation maps,
  - existing vegetation boundaries and proposed clearing limits,
  - location of all existing natural features such as wetlands, ponds, lakes, floodplains, and stream buffers,
  - location of existing and proposed roads, buildings, parking areas and other impervious surfaces,
  - location of existing and proposed utilities,
  - preliminary estimates of required water quantity management storage volumes and water quality management storage volumes,
  - preliminary selection and location of all storm water management control facilities including erosion and sediment control structures,



- location of existing and proposed conveyance systems such as grass channels, swales, and storm sewer systems,
- preliminary location and dimensions of all culvert and bridge crossings,
- Preliminary waiver or variance requests if applicable,
- Maintenance schedule for all proposed storm water control structures.
- Fort Jackson/military specific considerations

Upon submittal of the Concept Plan by Fort Jackson, the applicant shall create and submit a SWMP along with other portions of the submittal package, which are discussed in the following sections.

### **3.1.2.5 Creation of a SWMP**

The SWMP should be prepared upon receiving acceptance of the Storm Water Concept Plan. This shall consist of maps, narratives, and supporting design calculations for the proposed storm water system and should include the following sections when applicable:

- Pre-development hydrologic analysis and calculations that determine the existing storm water runoff volumes, peak flow rates and flow velocities,
- Post-development hydrologic analysis and calculations that determine the storm water runoff volumes, peak flow rates and flow velocities,
- Storm water management control facility design:
  - narrative describing the storm water management control facilities selected and methodologies to be used in their design,
  - location of all storm water management control facilities,
  - supporting calculations that justify that the facilities meet Fort Jackson and NPDES General Permit requirements, including but not limited to: hydrographs, stage storage volumes, stage-discharge values for water quantity and water quality control facilities and design calculations and elevations for all storm water conveyance systems,
  - a permanent maintenance plan for each permanent storm water management facility,
- Erosion and sediment control plan,
  - narrative describing the erosion and sediment control facilities selected,
  - location of all erosion and sediment control facilities,

- resulting design calculations and trapping efficiencies for all sediment control facilities,
- Downstream analysis calculations showing the effect of post-development design flows on downstream storm water conveyance systems and channels
- Water quality control plan
  - details on all water quality ponds and/or structures and strategy for controlling first segment of runoff.

More details of all elements that should be in the SWMP are provided in the later sections of this Handbook. A complete SWMP will be submitted to Fort Jackson for review and approval before initiating any construction activities on the proposed development site. Fort Jackson reserves the right to reject a SWMP and request a revision to address any deficiencies. If approved, the plan then becomes the Final SWMP.

#### **3.1.2.6 Completion of the SWMP**

If necessary, the revised SWMP shall reflect any changes or modifications requested or required by Fort Jackson and add further detail to the previously submitted plan. The improved version of the SWMP shall be resubmitted to Fort Jackson. Upon approval, this plan shall become the Final Storm Water Management Plan. Approval from Fort Jackson shall be required prior to initiating any construction activities on the proposed development site. Fort Jackson reserves the right to deny approval until the SWMP meets the requirements defined in this Handbook.

Once the Final SWMP is in place, Fort Jackson can issue the approval of land disturbance activities.

### **3.2 Submittal Requirements for Sites with Less than One Disturbed Acre**

The person or entity responsible for any land disturbing activity that disturbs less than one acre of land, and is not part of a larger common plan development, shall submit a Simplified SWMP. The steps to creating a robust storm water management plan as discussed above should be followed where applicable and appropriate. This plan requires approval by Fort Jackson. The Simplified SWMP shall contain the following items:

- Narrative description of the storm water management facilities to be used,
- General description of topographic and soil conditions at the development site,
- General description of the adjacent property and description of existing structures, buildings, and other fixed improvements located on surrounding properties,
- A sketch to accompany the narrative containing the following when applicable:

- site location drawing of the proposed project showing project location in relation to roadways, jurisdictional boundaries, streams, rivers and the boundary lines of the site to be developed,
- all areas within the site that will be included in the land disturbing activities shall be identified and the total disturbed area shall be calculated,
- anticipated starting and completion dates of the various stages of the land disturbing activities and the expected date of final stabilization shall be noted,
- location of temporary and permanent storm water management controls,
- Storm water management plans shall contain certification by the persons responsible for the land disturbing activities that the activities will be accomplished pursuant to the plan.

### **3.3 Submittal Requirements for Sites with Greater or Equal to than One Disturbed Acre**

The person or entity responsible for any activity that is disturbing one acre or more acres or is part of a larger common plan development, shall submit a Land Disturbance Submittal Package as defined by this section. This action should be preceded by the submittal of a Storm Water Concept Plan, if requested by Fort Jackson. This plan requires approval by Fort Jackson. The site plans, erosion and sediment control plans, specifications, and supporting calculations and computations shall be submitted and stamped/sealed by professionally licensed engineers, landscape architects, Tier B land surveyors, or other qualified Federal Government employees. The steps to creating a robust storm water management plan as discussed above should be followed where applicable and appropriate.

The remainder of this section of the Handbook explains the information required to attain the desired Land Disturbance Permit from Fort Jackson. The items discussed in this section of the Handbook should be used as a checklist prior to the submittal of the permit application. The Land Disturbance Submittal Package can be processed efficiently if all necessary information is included with the permit application. With proper planning and coordination, the permit processing time requirements can be kept to a minimum.

#### **3.3.1 Land Disturbance Permit Submittal Package Contents**

The initial Land Disturbance Submittal Package shall contain:

- A completed Fort Jackson Application Form for Land Disturbance Activities,
- A completed SC DHEC Form #2612 - Notice of Intent (to comply with NPDES General Permit SCS0000000),
- A completed Fort Jackson Land Disturbance Submittal Summary Form,

- One (1) copy of the Final SWMP, including all necessary supporting technical calculations, and
- Four (4) complete sets of certified (w/ COA) and signed construction plans and specifications,
- All necessary fees.

All application forms required for submittal are provided in the appendices of this Handbook. Other avenues may be available in the future.

### **3.3.2 Permits**

Unless specifically exempted, a Land Disturbance Permit and approved Final SWMP, as required by the Handbook, shall be obtained prior to the commencement of any development, redevelopment, building, excavating, grading, re-grading, paving, landfilling, berming or diking of any property located within Fort Jackson. Coverage under the General Permit is obtained through approval of the Land Disturbance Submittal Package from Fort Jackson.

Other applicable permits such as Federal, State or other local agency may be required for specific project sites. For example, the US Army Corps of Engineers must be notified for all disturbance activities effecting more than 1/3 of an acre in a Water of the State. It is the applicant's responsibility to recognize the need to obtain all necessary permits before submitting for the Land Disturbance Submittal Package.

### **3.3.3 Storm Water Management Design Standards and Technical Requirements of the SWMP**

It is an overall goal of this Handbook to address storm water management to provide effective water quantity and water quality solutions due to the impact of land development on existing/natural hydrologic and hydraulic processes. The following set of criteria shall be followed in the absence of designated specific watershed master plan criteria.

#### **3.3.3.1 General**

The following items are required to be included in the submittal package for a Land Disturbance Permit as part of the SWMP. These items can be presented separately or on or part of others sections of the SWMP, i.e. construction documents. This list is followed by technical design requirements.

- Watershed delineation maps with consistent sequential notations,
- Narrative of the existing conditions at the site and the proposed storm water management plan and all component to be used,
- Location map showing all discharge points and drainage patterns (a 1:24,000 scale USGS topographic map is recommended for this portion),

- Location/drawing of existing and proposed structures used for storm water management, including outfalls, the collection system, and erosion control measures,
- Location of identified 100-year floodplains as presented on FIRM maps,
- Identification of any wetlands,
- Identification and classification of all soil types expected to be encountered or used at the development site,
- Presentation existing and proposed contours at the development site,
- General description of the adjacent property and description of existing structures, buildings, and other fixed improvements located on surrounding properties,
- Discussion of all methodologies and models to be used,
- Construction limits and sequence and maintenance requirements during and after construction,
- Site access, and
- Design details and computation for all storm water management controls, including storage facility routing, pipe capacity and velocity calculations, open channel capacity and velocity calculations, and water surface elevations.

### **3.3.3.2 Hydrologic computation requirements**

All hydrologic computations shall be completed using acceptable volume based hydrograph methods. The design storm duration for these computations shall be the 24-hour storm event and a SCS Type II distribution with a 0.1-hour duration time increment. Typical hydrologic input includes but is not limited to the following:

- Rainfall depth or intensity,
- USGS soil classification and hydrologic soil group,
- Land use,
- Time of concentration, and
- Abstraction.

The remainder of this section will provide basic information for the hydrologic calculations needed in a project's SWMP. As discussed, the intent of the Handbook is not to provide detail on every aspect of hydrologic computations, their limitations, assumptions, appropriateness of

use, etc. However, this Handbook references suggested materials as necessary for detailed discussion of related topics.

### 3.3.3.2.1 Inputs

The precipitation depths/intensities corresponding to various return periods to be used for projects on Fort Jackson are shown in Table 3.1.

**Table 3.1: Design storm precipitation data for Fort Jackson, South Carolina**

First-Flush	2-yr	10-yr	25-yr	100-yr
1 <sup>st</sup> ½" runoff	3.7	5.7	6.4	7.9

Soil types on Fort Jackson are predominantly sands and sandy clays. Appendix E contains a soil map of Fort Jackson. Information on soil type and hydraulic classification for all parts of the fort can be found there. Land use information is required for modeling the appropriate runoff potential for a project. Existing land use and corresponding runoff potential factors should be obtained from the site visit. Appropriate runoff potential factors can be found in several of the references listed in Chapter 4.

### 3.3.3.2.2 Recommended methodologies

The Fort Jackson recommended methods and corresponding design circumstances are listed in Table 3.2 and Table 3.3 below. If other methods are used, they must first be calibrated to local conditions and tested for accuracy and reliability and then submitted to Fort Jackson for approval. In addition, complete source documentation must be submitted for approval.

**Table 3.2: Recommended methodologies based on land disturbance area**

Method	Size Limitations*	Comments
(Modified) Rational Method	0 – 2 Acres	Acceptable for sizing individual culverts or storm drains that are not part of a pipe network or system. <u>Not to be used for storage design.</u>
“SCS Method” (TR-55)	0 – 2000 Acres	Used for estimating peak flows from urban areas.
USGS Regression Equation	> 2000 Acres	Used for estimating peak flows for all design applications for areas between 2,000 and 16,000 acres and estimating hydrographs for all design applications for areas between 128 and 16,000 acres.

\*Size limitations refers to the subwatershed size to the point where stormwater management facility (i.e., culvert, inlet, BMP) is located.

Details of Rational Method and Modified Rational Method can be found in Chow (1988), ASCE(1996), USDA (1996, 2001), and Mays (2001). When using this methodology, regional coefficients are needed to calculate the rainfall intensity. These regional coefficients can be found in the Richland County Land Development Regulation, Section 4 (<http://www.richlandonline.com/departments/publicworks/stormwater/forms/Design%20Standar>

[ds.pdf](#)). SCS Method documentation can be found on the US Department of Agriculture website (<http://www.wcc.nrcs.usda.gov/hydro/hydro-tools-models-tr55.html>). The USGS regression equations for South Carolina can be obtained from Appendix F, the US Geological Survey website (<http://water.usgs.gov/osw/programs/nffpubs.html>). In addition, the US Department of the Army and Air Force (1987a, 1987b) has two technical manuals addressing hydrology, “Surface Drainage Facilities for Airfields and Heliports” and “Drainage for Areas other than Airfields”. Complete references are given in Section 4.

**Table 3.3: Recommended hydrologic methods for designing various storm water management systems and controls**

Method	Rational Method	SCS Method	USGS Equations
Extreme Flood Protection		+	+
Storage/Sedimentation Facilities		+	+
Outlet Structures		+	+
Gutter Flow and Inlets	+		
Storm Drain Pipes	+	+	+
Culverts	+	+	+
Small Ditches	+	+	+
Open Channels		+	+
Energy Dissipation		+	+

Methods for calculating the time of concentration and abstraction are numerous. However, a minimum time of concentration of six (6) minutes shall be used for all hydrologic calculations. See references given above for the suggested methodologies for information on these calculations.

### 3.3.3.2.3 Hydrographs

Hydrographs should be used to evaluate entire systems by routing storm events through pipe or storage systems. The use of a hydrograph will provide better insight into a system performance than the use of peak discharge can. SCS (USDA 1986) has developed a tabular hydrograph procedure that can be used to generate hydrographs for small drainage areas less than 2,000 acres. The tabular hydrograph procedure uses unit discharge hydrographs that have been generated for a series of time of concentrations. In addition, SCS has developed hydrograph procedures to be used to generate composite flood hydrographs. The development of a runoff hydrograph from a watershed is a tedious, laborious process not normally performed by hand because of the simplicity of current computer model applications. Chow (1988) is also an excellent reference on this topic. Many computer models are now used to compute these

hydrographs using many types of methodologies. Fort Jackson will accept such models once it has been proven to precisely execute a given methodology.

### **3.3.3.3 Water quantity control requirements**

Water quantity control is an integral component of overall storm water management. Its purpose is to negate the effects of development on large storm events. Quantity control is effectively flood control, reducing potential damages and health risks. The following design criteria are established for water quantity control. All designs of storage facilities utilized for storm water quantity control and required downstream analyses shall be submitted with the SWMP when applying for a Land Disturbance Permit.

- Potential controls include above ground wet or dry detention basins, and retention ponds.
- Post-development discharge rates shall not exceed pre-development discharge rates for the 2-, 10-, and 25-year frequency 24-hour duration storm events.
  - Multi-stage control structures may be required to control the 2-, 10- and 25-year storm events.
  - The same hydrologic procedures shall be used in determining both the pre-development and post-development peak flow rates.
- Post-development discharge velocities shall be reduced to provide non-erosive flow velocities from structures, channels or other control measures, or be equal to the pre-development 25-year 24-hour storm event flow velocities, whichever is greater.
- Emergency spillways shall be designed to safely pass the post-development 100-year 24-hour storm event without overtopping any dam structures.
- All dry detention basin volumes shall be drained from the structures within 72 hours. Volume control is encouraged using acceptable BMPs such as engineered devices, infiltration basins, and grassed swales.
- Downstream analysis shall be required for the 2-, 10-, 25-, and 100-year frequency 24-hour duration storm events for all development sites unless a waiver or variance is granted from this analysis. When water quantity controls are implemented, an off-site analysis waiver may not be required, provided that all required design criteria of the Handbook are met. Analysis should be performed for both existing and proposed conditions at a point where development is approximately 10 percent of total drainage area, locations of past quantity issues, where downstream residential sites exist, all road crossings, and others as directed by Fort Jackson. All system components are potential analysis items. Possible actions to mitigate development's impact include on- or off-site control or



improvement to downstream conveyance measures. Analysis criteria shall include, but is not limited to:

- existing land use curve numbers shall be used for developed areas upstream,
  - existing land use for upstream and downstream areas of interest may be used, but future land use, when applicable, is recommended for conservative results,
  - routing of flows using an accepted hydrologic and hydraulic method from Chapters 5, and 6,
  - hydraulic step-backwater calculations (Corps of Engineer's HEC-2 or HEC-RAS models or equivalent) shall be performed to determine flood elevations of any downstream impacted areas, and
  - the effects of any upstream and proposed storm water quantity or quality structures.
- Vegetated embankments shall be less than 15-feet in height and shall have side slopes no steeper than 3H:1V. Embankments protected with Erosion Control Blankets or Turf Reinforcement Matting shall be no steeper than 2H:1V. Geotechnical slope stability analysis is required for slopes greater than 10-feet in height and embankments that have steeper slope than those indicated above.
  - A minimum freeboard of 1-foot above the 100-year 24-hour design storm high water elevation shall be provided for impoundment depth less than 15-feet. Impoundment depths greater than 15-feet are subject to the requirements of the Federal Emergency Management Agency's (FEMA) Dam Safety Guidelines (FEMA 1998) unless the facility is excavated.
  - The bottom of detention structures shall be graded towards the outlet structure to prevent standing water conditions. A minimum 0.5% bottom slope is recommended.
  - The maximum depth of permanent storage facilitates shall be determined by site conditions, design constraints, and environmental needs. The facility should provide a permanent pool of water with a depth sufficient to discourage weed growth without creating undue potential for anaerobic bottom conditions. A depth of 6- to 8-feet is reasonable unless fishery requirements dictate otherwise. Aeration may be required for permanent pools to prevent anaerobic conditions. Wildlife experts shall be contacted when aquatic habitat is required.
  - A dam is defined as being an artificial barrier that impounds water to a depth of 15-feet or greater and has a maximum storage volume of 10 acre-feet or greater. Several exemptions may be allowed in FEMA's Dam Safety Guidelines Act and

any question concerning a specific design application should be addressed to the Fort Jackson.

- An access area is required comprised of a minimum of 10 feet along both sides of all drainage ways, streams, channels, ditches, and around the perimeter of all detention and retention facilities. Sufficient land area for equipment access for basin maintenance shall be provided.
- A safety fence shall be implemented around all storm water basins that are greater than 2-feet in depth.
- Watersheds that have well documented water quantity problems may have more stringent or modified design criteria determined from master plan studies. Such situations will be dictated by Fort Jackson. Some examples of variable criteria include but are not limited to:
  - post-development discharge rates from the entire development area not exceeding pre-development discharge rates for storm frequencies greater than the 25-year frequency 24-hour duration storm event,
  - post-development discharge volumes from the entire development area not exceeding pre-development discharge volumes,
  - reduction of peak flow rates from pre-development to post-development,
  - reduction of total volume released from pre-development to post-development, and
  - downstream channel, culvert or property improvements.
- A project may be eligible for a waiver from the storm water management requirements for water quantity control if the applicant can justly verify that:
  - the proposed project will not create any significant adverse effects on the receiving natural waterway downstream of the property and
  - the imposition of peak flow rate control for storm water management would create, aggravate, or accelerate downstream flooding.

Documentation on the design, installation, and maintenance of storage facilities can be found in USDA (2001b), ASCE & WEF (1994), and Mays (2001).

### **3.3.3.3.1 Accepted storage controls**

Detention structural controls are used for providing water quantity control and are typically used downstream of other minor structural controls. These structures are designed to provide channel protection, overbank flood protection, and any adverse downstream impacts that are related to

the increase in peak flow rates and flow volumes from development. Detention structural storm water controls accepted by Fort Jackson are shown in Table 3.4.

**Table 3.4: Accepted storage controls**

General Structural Control	Description
<b>Dry Detention/Dry Extended Basins</b>	Dry detention basins and dry extended detention basins are surface storage facilities intended to provide temporary storage of storm water runoff and releasing it at a designed flow rate to reduce downstream water quantity impacts. These structures are designed to completely drain to a dry condition within 72 hours.
<b>Wet Storm Water Detention Basins</b> <ul style="list-style-type: none"> <li>• Wet Pond</li> <li>• Wet Extended Detention Pond</li> <li>• Micropool Extended Detention Pond</li> <li>• Multiple Pond System</li> </ul>	Wet detention basins are constructed storm water basins that have a permanent pool or micropool of water. Runoff from each rain event is detained above the permanent pool and released at a designed flow rate to reduce downstream water quantity impacts.
<b>Multi-purpose Detention Areas</b>	Multi-purpose detention areas are used for one or more specific activities such as parking areas and rooftops. These areas are used to provide temporary storage of runoff. Some of the multi-purpose area such as infiltration trenches or bio-retention areas may also be used for water quality purposes.
<b>Underground Detention</b>	Underground detention is used as an alternative to surface dry-detention basins. They are used in areas that are space-limited where there is not enough adequate land to provide the required detention volume. The underground storage utilizes tanks, vaults, and buried pipes to supply the required storage volume.

### 3.3.3.3.2 Design procedures

This section provides the general procedures for the design of storm water quantity structures. The following items shall be required for the design of these structures and routing flows through them:

- Compute the inflow hydrograph for the structure.
- Compute a stage-storage relationship for the proposed structure. A stage storage-curve defines the relationship between the depth of water and storage volume within the detention facility.
- Compute stage-discharge relationship of the outlet control structure(s).
- Perform routing calculations for the 2-, 10-, 25- and 100-year 24-hour storm events. These may be done by hand, or may be done by using a storage routing computer model.
- Evaluate the control structure outlet flow velocity and provide velocity control and channel stabilization if needed. Standard drawings are provided for preferred outlet structures. Other will be accepted once evidence is submitted proving its ability to perform as designed.

Routing of hydrographs is critical to the proper design of storm water quantity control structures. Storage design procedures have been formulated without using routing, but the use of these methods in designing storm water quantity structures has not produced acceptable results for the Southeastern United States.

Stage-storage and stage-discharge calculations should be included in the SWMP. Common methodologies for stage-storage curves include the double end area method, and the pyramid frustum method. Other methods will be accepted upon justification of their integrity.

Hand calculations are available for routing hydrographs through detention structures, however they are time consuming and inefficient when multiple designs are required to be evaluated. For this Handbook, it is assumed that the design professional will be using one of the many computer software packages available to perform storage routing calculations. All models/methodologies used should be acceptable to Fort Jackson.

### 3.3.3.4 Water quality control requirements

Water quality control is an integral component of overall storm water management. The following design criteria are established for water quality control unless a waiver is granted on a case-by-case basis.

- Permanent water quality ponds and water quality structures having a permanent pool elevation shall be designed to store and release the first ½-inch of runoff from the site over a minimum period of 24-hours in addition to satisfying flow

rate control for the 2-, 10-, and 25-year storm events. The storage volume of these water quality structures shall be designed to accommodate at least ½-inch of runoff from the entire site. The Urban Drainage and Flood Control District around Denver, Colorado (UDFCD 2003) offers another method for estimating this required water quality volume.

- Permanent water quality structures not having a permanent pool elevation shall be designed to store and release the first 1-inch of runoff from the site over a minimum period of 24-hours.
- Permanent water quality infiltration practices shall be designed to accommodate at a minimum the first 1-inch of runoff from impervious areas located on the site.
- When existing wetlands are intended to be water quality facilities, the Storm Water Management Permit shall not be implemented until all necessary Federal and State permits have been obtained.
- Commercially available products can be used as water quality control measures. Applicability of such devices will be determined on a project-by-project basis.

#### 3.3.3.4.1 Water quality BMPs

The varieties of water quality BMPs are numerous. With the proper planning, installation, and maintenance, BMPs can be expected to reduce pollutant loads to receiving waters, reduce erosion, provide health and safety benefits, and be cost effective. BMPs are considered either structural or non-structural. Fort Jackson's current approved list of storm water quality BMPs and a description of each are given in Table 3.5. This is followed by a brief discussion of some recommended non-structural BMPs and suggested innovative approaches, including Low-Impact Development (LID), which are encouraged and accepted.

All storm water quality BMPs must be designed in accordance with the Handbook, installed properly, and be properly maintained. Further information on the design of structural BMPs can be found in NVPDC (1992), Schueler (1987), and WEF & ASCE (1998).

**Table 3.5: Structural controls**

General Structural Control	Description
<b>Wet Ponds</b>	Wet storm water ponds are constructed storm water basins that have a permanent pool or micropool of water. Runoff from each rain event is detained and treated in the pool, and released at a designed rate.
<b>Storm Water Wetlands</b>	Storm water wetlands are constructed wetland systems used for storm water management. Storm water wetlands consist of a combination of shallow marsh

General Structural Control	Description
	areas, open water and semi-wet areas above the permanent water surface.
<b>Bioretention Areas</b>	Bioretention areas are shallow storm water basins or landscaped areas that utilize engineered soils and vegetation to capture and treat storm water runoff. Runoff may be returned to the conveyance system or partially exfiltrate into the soil.
<b>Sand Filters</b>	Sand filters are multi-chamber structures designed to treat storm water runoff through filtration, using a sand bed as its primary filter media. Filtered runoff may be returned to the conveyance system or partially exfiltrate into the soil.
<b>Infiltration Trench</b>	An infiltration trench is an excavated trench filled with stone aggregate used to capture and allow infiltration of storm water runoff into the surrounding soils from the bottom and sides of the trench.
<b>Enhanced Grassed Swales</b>	Enhanced swales are vegetated open channels that are explicitly designed and constructed to capture and treat storm water runoff within dry or wet cells formed by check dams or other structures.
<b>Engineered Devices</b> <ul style="list-style-type: none"> <li>• Vortex Separator</li> <li>• Baffles</li> <li>• Cartridges</li> <li>• Skimmers</li> <li>• Bioretention</li> <li>• Gravity Oil-Grit Separator</li> <li>• Filter Material</li> <li>• Sedimentation</li> <li>• Inlet inserts</li> <li>• Constructed wetland uptake.</li> </ul>	Pre-fabricated controls use the movement of storm water runoff through a specially designed structure to remove target pollutants. They are typically used on smaller commercial sites and urban hotspots. There are numerous commercial vendors of these structures, but there is limited data on the performance of these structures. Until further research is done and substantial removal efficiencies are published, these structures may require monitoring. Some of the popular vendors/products include but not limited to Crystal Stream, Vortechtechnics, Aquashield, Filterra, Stormceptor, Stormfilter, CDS, BaySaver, and Downstream Defender. This is by no means a complete list and Fort Jackson will evaluate any such device if included in designs.

Some structural BMPs have limited applications and recommended only for limited use for special site or design conditions. Generally, these practices can not alone achieve 80 percent TSS removal goal and are intended for hotspots for specific land use constraints or conditions. Limited application controls may be used within a system of water quality controls and are very effective pre-treatment structures for the controls listed in Table 3.5. Limited application structural controls should be designed and used only in development situations where regular maintenance is guaranteed. Some popular limited storm water controls are shown in Table 3.6.

**Table 3.6: Limited structural controls**

Limited Structural Control	Description
<b>Vegetated Filters</b> <ul style="list-style-type: none"> <li>• Filter Strip</li> <li>• Grassed Channels and Swales</li> </ul>	Both filter strips and grassed channels provide filtering of storm water runoff as it flows across the vegetation. However, by themselves these controls do not consistently obtain an 80% TSS removal. Both filter strips and vegetated channels shall be used as pretreatment measures or part of a treatment system approach.
<b>Submerged Gravel Wetland Systems</b>	Submerged gravel wetlands use wetland plants in a submerged gravel or crushed rock media to remove storm water runoff pollutants. These systems should only be used in mid- to high- density environments where other structural controls will be utilized.
<b>Small Sand Filters</b> <ul style="list-style-type: none"> <li>• Surface Sand Filter</li> <li>• Perimeter Sand Filter</li> </ul>	Sand filters are multi-chamber structures designed to treat storm water runoff through filtration, using a sand bed as its primary filter media. Filtered runoff may be returned to the conveyance system or partially exfiltrated into the soil.
<b>Porous Paver Systems</b>	Porous paver systems consist of open void paver units laid on gravel subgrade to promote storm water infiltration. Porous pavers provide water quality and quantity benefits, but have high maintenance requirements.

Regardless of the control, maintenance schedules should be included for each BMP proposed. This will provide adequate planning and cost allocation to Fort Jackson, who is responsible for all maintenance activities.

Listed below are some non-structural BMPs that should be considered for use in larger land disturbance activities and re-development projects.

- Buffers: an area along a shoreline, wetland, or stream where development is restricted or prohibited. The primary function of the buffer is to physically protect and separate a stream, lake, or wetland from future disturbance or encroachment.
- Disconnected roof drains/impervious areas: directing storm water runoff from rooftops towards pervious areas where it is allowed to filter through vegetation and other landscaped material and infiltrate into the soil.
- Grass/Porous pavements: allows for the reduction of paved areas by implementing areas that are infrequently used, providing water quality benefits through increased infiltration.
- Cluster development: concentrate development away from environmentally sensitive areas such as streams, wetlands, and mature wooded areas.

### **3.3.3.5 Erosion prevention and sediment control requirements**

The following items are required to be included as part of the SWMP addressing erosion prevention and sediment control (EPSC). EPSC plans are required for all activities disturbing more than 5,000 ft<sup>2</sup> or as required by Fort Jackson. These items can be presented separately or be part of other sections of the SWMP. Fort Jackson prefers that the EPSC plans be presented separately. This is not only a proactive measure to safeguard downstream environments, but is particularly important due to the erodibility of the soils common on Fort Jackson.

- Location of all erosion and sediment control structures,
- Delineation of all sensitive features and potential sediment sources,
- Installation sequencing and maintenance schedules for all EPSC BMPs during and after construction,
- Provisions to preserve topsoil and limit the amount of total disturbed area,
- Details of site grading,
- Design details and computations for all EPSC structures,
- Silt fencing shall be placed at the toe of all fill slopes and soil berms and below disturbed areas where the size of the area is no more than ¼ acre per 100 feet of



silt fence length. The maximum slope length behind the fence is 100 feet and the maximum gradient behind the fence is 25 percent.

- Protection of all storm drain inlets and outlets,
- List of the trapping efficiency for each sediment control structure,
- Calculation of required sediment storage volumes, and
- Explanation of any computer models or software used with highlights of and/or notes on the output data.

The following nonstructural site management practices shall be utilized on the plans where applicable:

- Minimize site disturbance to preserve and maintain existing vegetative cover,
- Limit the number of temporary access points to the site for land disturbing activities,
- Phase and sequence construction activities to minimize the extent and duration of disturbed soil exposure, and
- Locate temporary and permanent soil disposal areas, haul roads and construction staging areas to minimize erosion, sediment transport and disturbance to existing vegetation.

#### **3.3.3.5.1 Design removal efficiency goal**

Sediment control structures shall be designed to accommodate the anticipated sediment loading from all land disturbing activities and meet a design removal efficiency of 80 percent total suspended solids (TSS) or 0.5 ml/L peak settleable solids concentration, whichever is less, for disturbed conditions for the 10-year 24-hour storm event.

#### **3.3.3.5.2 Design requirements**

A sediment detention basin is required when 10 or more acres of disturbed land area drain to a single outlet point. Such basins shall be designed to have a design removal efficiency of 80 percent suspended solids (TSS) or 0.5 ml/L peak settleable solids concentration, and control the 10-year 24-hour storm event to pre-development conditions and successfully pass the 100-year 24-hour storm event. The person responsible for the activity shall submit a full application which shall be prepared or certified by a registered engineer, landscape architect, Tier B land surveyor, or other qualified Federal Government employees.

Activities that disturb between 1 and 10 acres of land area that does not drain to a single outlet point may incorporate other practices other than a sediment basin to achieve the equivalent removal efficiency.

Sediment storage volumes shall be calculated for all sediment controls to determine the required clean-out frequencies and maintenance schedules. The Universal Soil Loss Equation (USLE) or other acceptable methods that determine sediment yield may be used to predict the required sediment storage volumes for specific sediment control structures.

Detailed EPSC plans shall comply with the following specific standards and review criteria:

- Sediment Tracking Control. Stabilized construction entrances shall be located and utilized at all points of ingress/egress on a construction site. The transfer of soil, mud, and dust onto roads shall be prevented.
- Crossings of waterways during construction should be minimized and must be approved by Fort Jackson. Encroachment into stream buffers riparian areas and wetlands should be avoided when possible.
- Topsoil shall be stockpiled and preserved from erosion or dispersal both during and after site grading operations when applicable.
- Temporary Stabilization Measures. Where construction or land disturbance activity will or has temporarily ceased on any portion of a site, temporary site stabilization measures shall be required as soon as practicable, but no later than 14 calendar days after the activity has ceased.
- Final Stabilization. Final Stabilization of the site shall be required within 14 calendar days of construction completion.
- Temporary Structural Controls installed during construction shall be designed to accomplish maximum stabilization and control of erosion and sedimentation, and shall be installed, maintained, and removed according to the specifications set forth in the Handbook, Standard Specifications and Standard Drawings. All temporary structural controls shall be designed to control the peak runoff resulting from the storm event identified in the Handbook, Standard Specifications and Standard Drawings.
- All Permanent Structural Controls, including drainage facilities such as channels, storm sewer inlets, and detention basins, shall be designed according to the standards set forth in the Handbook, Standard Specifications and Standard Drawings.

### **3.3.3.5.3 Alternative erosion prevention and sediment control BMPs**

To encourage the development and testing of innovative alternative EPSC BMPs, alternative management practices that are not included in the Handbook or Standard Drawings (Appendix G) may be allowed upon review and approval. To use an alternative BMP, the design professional shall submit substantial evidence that the proposed measure will perform at least equivalent to currently approved BMPs contained in the Handbook and Standard Drawings. Evidence may include, but is not limited to:

- Supporting hydraulic and trapping efficiency calculations.
- Peer-review by a panel of licensed professional engineers.
- Research results as reported in professional journals.
- Manufacturer literature.

#### **3.3.3.5.4 Design procedures**

Control of sedimentation from construction sites may be accomplished through the utilization of a variety of EPSC BMPs. The complexity of the erosion and sediment control plan will vary depending on the individual site conditions. The goal of implementing the erosion control plan is to limit the quantity of sediment being eroded from, and leaving a construction site. This may be partially accomplished through the implementation of EPSC BMPs. However, these sediment trapping controls typically only remove a small portion of the clay particles eroded from the site. The best protection is provided by a combination of practices including temporary and permanent stabilization, flow diversions, and streambank protection, all which minimize the amount of soil that is eroded from the site.

All land development shall be planned in such a way to control and limit erosion and sediment discharge from construction sites using, but not limited to, the BMPs listed in this chapter. The goal of these erosion and sediment control BMPs shall be to:

- Minimize the extent and duration of disturbed soil exposure,
- Protect off-site and downstream locations, drainage systems and natural waterways from the impacts of erosion and sedimentation,
- Limit the exit velocities of the flow leaving the site to non-erosive or pre-development conditions, and
- Design and implement an ongoing inspection and maintenance plan.

#### **3.3.3.5.5 Erosion prevention measures**

Erosion prevention measures shall be used during and after construction site preparation in order to safely convey clean water to storm drains or adequate watercourses. One or more measures should be utilized as appropriate during the project's construction phase. Such measures may include but are not limited to: phasing and construction sequencing, surface roughening, temporary seeding, mulching, matting, rip-rap or aggregate (channels, aprons, outlets, etc.) and geotextile blankets. Details on each and of these measures and others, including design, installation, and maintenance, can be found in Appendix G and SCDHEC (2002).

In addition to site-specific erosion control measures, the grading plan should include the following general measures as a minimum:

- The finished cut and fill slopes to be vegetated should not be steeper than 3H:1V. The finished grades of cut and fill slopes to be vegetated with vines and/or groundcovers should not be steeper than 1H:1V.
- Cuts or fills should not be so close to property boundaries as to endanger adjoining property without adequately protecting such properties against erosion, sedimentation, slippage, settlement, subsidence, or other damages.
- Subsurface drainage should be provided in areas having a high water table to intercept seepage that would affect slope stability, bearing strength or create undesirable wetness.
- No fill shall be placed where it can slide or wash onto another property.
- Fill shall not be placed adjacent to channel banks where it can create bank failure, reduce the capacity of the stream, or result in downstream sediment deposition.
- All borrow and disposal areas should be included as part of the grading plan.
- Adequate channels and floodways should be provided to safely convey increased runoff from the developed area to an adequate outlet without causing significant channel degradation, or increased off-site flooding.
- The site should be graded to direct flows to appropriate controls.

#### **3.3.3.5.6 Temporary sediment control measures**

Fort Jackson emphasizes erosion prevention in EPSC plans. However, there are always instances where erosion can not be prevented. For these situations, temporary sediment controls must be implemented to control the migration of eroded sediment off site. The following sediment control measures are applicable as temporary practices for use during construction. One or more of the measures should be utilized as appropriate during the project's construction phase. A discussion of the planned measures will be required during the review of the Storm Water Concept Plan for sites containing sensitive features.

There are many types of temporary control measures. Some of the more common and suggested include: temporary sediment and multipurpose basins, sediment traps, silt fences, rock and composite check dams, inlet protection, vegetated filter strips, and rock sediment dikes. There are also many proprietary devices such as socks and tubes available for inlet protection, berms, dikes, check dams and many other EPSC purposes. These devices will be evaluated by Fort Jackson as necessary. Details on these and other measures are again not discussed in detail in the Handbook. An excellent reference is Hann, Barfield, and Hayes (1995).

#### **3.3.3.5.7 Runoff controls and conveyance measures**

In addition to temporary measures, EPSC BMPs that control runoff should in addition to other BMPs listed in this Handbook provide the overall protection of downstream environments.

Suggested varieties include pipe slope drains, protection at stream crossings, de-watering, level spreaders, subsurface drains, diversion dikes, and berms. Details on these and other EPSC BMPs can be found in Appendix G.

### 3.3.3.5.8 Permanent vegetation

The following design requirements shall be followed to establish permanent vegetation:

- Planting Specifications:
  - 1.5 tons of agricultural lime per acre (70 #/1000 square feet)
  - when hydroseeding, 2 gallons liquid lime per acre in addition to agricultural lime
  - 700 # 10-10-10 fertilizer ,or equivalent, per acre (16# per 1000 square feet)
  - Incorporate lime and fertilizer
  - Plant seed using conventional planting, broadcast, or hydroseeding methods
  - Mulch with 1 ½ tons per acre wheat straw
  - Crimp straw into soil or use a tackifier to hold straw in place
- Suggested Seeding Mixtures

**Table 3.7: Tall grass mixture for spring/summer seeding in unmowed areas  
(optimum date to plant is March 1<sup>st</sup> – June 15<sup>th</sup>)**

Seed	Pounds / Acre	Ounces / 1000 ft <sup>2</sup>	Minimum % purity	Minimum % germination	Footnotes
*Oats	10	4	98	85	
Browntop millet	10	4	98	85	
Bahiagrass	25	8	65	70	
Appalow secretia lespedeza (scarified)	20	8	98	85	(1) (2)
Weeping lovegrass	2	1	95	80	
Kobe	5	2	97	85	(1)

Seed	Pounds / Acre	Ounces / 1000 ft <sup>2</sup>	Minimum % purity	Minimum % germination	Footnotes
lespedeza					(2)
Switchgrass	2 PLS (3)	1			

\*Oats should be added to mixture if seeding date is prior to April 15.

**Table 3.8: Turf mixture for spring/summer seeding in mowed and maintained areas  
(optimum date to plant is March 1<sup>st</sup> – June 15<sup>th</sup>)**

Seed	Pounds / Acre	Ounces / 1000 ft <sup>2</sup>	Minimum % purity	Minimum % germination	Footnotes
Browntop millet	10	4	98	85	
Bahiagrass	30	11	65	70	
Common bermudagrass (w/o hull)	6-8	3-4	97	85	

**Table 3.9: Tall grass mixture for fall/winter seeding in unmowed areas (optimum  
date to plant is September 1<sup>st</sup> – November 15<sup>th</sup>)**

Seed	Pounds / Acre	Ounces / 1000 ft <sup>2</sup>	Minimum % purity	Minimum % germination	Footnotes
Rye (grain)	56	21	97	85	
Bahiagrass	40	15	65	70	
Appalow sericea Lespedeza (unscarified)	60	22	98	85	(1) (2)
Switchgrass	2 PLS	1			(3)
Crimson Clover	5	2			

**Table 3.10: Turf mixture for fall/winter seeding in mowed and maintained areas  
(optimum date to plant is September 1<sup>st</sup> – November 15<sup>th</sup>)**

Seed	Pounds / Acre	Ounces / 1000 ft <sup>2</sup>	Minimum % purity	Minimum % germination	Footnotes
Rye (grain)	56	21	97	85	
Bahiagrass	40	15	65	70	
Common bermudagrass (w/o hull)	8	4	97	85	

\* Common bermudagrass with hulls can also be planted from January 10<sup>th</sup> – March 20<sup>th</sup>)

Footnotes: (1) Includes hard seed

(2) Seeds of appalow sericea lespedeza, Kobe lespedeza, and Crimson Clover shall be inoculated with an appropriate culture of nitrogen-fixing bacteria. The inoculate shall be applied in accordance with the manufacturer's directions. (If hydroseeding, use 4 times the recommended rate or inoculant).

(3) Pure live seed: Seed germination shall not be less than 50%.

- Suggested maintenance fertilizer: Maintenance Fertilizer. In the nutrient-poor soils of Fort Jackson, all seeded areas should have a follow-up application of fertilizer at the beginning of the second growing season at a rate of approximately 500 pounds of 10-10-10 or equivalent (11# per 1000 square feet).

### **3.3.3.6 Storm water drainage system design**

This section provides the design requirements for various storm sewer drainage/collection system components including: design storms, velocities; and, pipe and inlet sizes.

#### **3.3.3.6.1 Design requirements**

Storm drainage systems shall include all storm drainage structures and pipes that do not convey runoff under roadways. These systems are commonly referred to as lateral closed systems.

The storm drainage systems shall be designed based upon the following criteria:

- 25- year 24-hour design storm event capacity for pipe design,
- 25- year 24-hour design storm event capacity for inlet structure design,
- 25- year 24-hour design storm event capacity for drainage channels,
- 50-year 24-hour design storm event capacity for sump inlets, unless overflow facilities are designed,
- 00-year 24-hour storm event shall be used to check all drainage designs using for local flooding, and possible flood hazards to adjacent structures and/or property.
- The Rational Method and SCS Method for peak runoff flow rates are acceptable techniques (see section 3.3.3.2 for limits on drainage areas),
- The minimum pipe size is 15 inches,
- Hydraulic grade line and head loss calculations for determining water surface elevations shall be performed for all systems with 10 or more connections,
  - calculations should be performed for the 25-year 24-hour design storm event,

- for storm drainage systems with less than 10 connections, Manning's Equation shall be acceptable for sizing the capacity of drain pipes for non-submerged conditions where the free water surface elevation is below the crown of the pipes,
  - if the outlet is submerged in a backwater condition, a more sophisticated design methodology than Manning's Equation shall be required. Individual head losses in the pipe systems shall be calculated. These head losses are added to a known downstream water surface elevation to give a design water surface elevation for a given flow at a desired upstream location. Various accepted computer models are available for analysis of storm drain systems under backwater and/or pipe flow surcharge conditions,
  - storm drain profile plots should be included in the set of construction plans.
- Minimum design velocity for pipe flow shall be 2.0-feet/sec at the design flow or 2.5-feet/sec at full flow, whichever requires the greater slope,
  - Maximum design velocity shall be 20-feet/sec,
  - Minimum slope of storm drain systems shall be 0.5 percent,
  - Storm drainage systems shall be designed to convey storm water runoff by gravity flow unless otherwise approved,
  - For very flat flow lines, flow velocities shall increase progressively throughout the system. Upper reaches of the pipe system may have flatter slopes than the lower end of the system. Progressively increasing slopes keep solids moving toward the outlet and inhibit the settling of particles,
  - All discharges should be to existing structures. Justification that discharge rates from proposed development does not adversely impact existing drainage features should be included as necessary,
  - Minimum fill cover on all pipes shall be 1-foot. The maximum cover shall be based on the design loads which are calculated from pipe shape, pipe size, pipe material and location,
  - The following design requirements shall be followed to compute the capacity of storm drain inlets and grates by applying appropriate weir, orifice, and pipe flow characteristics:
    - inlets shall be designed to convey the 10-year 24-hour storm event,



- maximum depth in which the water may pond above or around an inlet must not threaten surrounding permanent structures or facilities including vehicular or pedestrian traffic,
- inlets placed in sump conditions shall have emergency overflow points designed,
- inlets placed in roadway gutter lines must be spaced to prevent flow from entering road intersections,
  - maximum spread of 6-feet in the travel lane.
  - valley gutter shall have a maximum allowable spread of 7-feet.
  - standard 2-feet 6-inch curb and gutter is allowed a total maximum spread of 8-feet from the face of the curb.

In depth design procedures for inlet and storm sewer design may be referenced in AASHTO (1999), Yen (2001).

### **3.3.3.7 Open channel hydraulics**

Open channels shall include all permanent storm drainage channels including swales, culverts, and diversions. These storm drainage systems shall be designed based upon the following criteria:

- Channels shall be designed to carry the 25-year 24-hour design storm event.
- Major channels may be designed for greater storm frequencies if directed by Fort Jackson.
- Design conditions can be assumed to be steady, uniform flow.
- Minimum channel slope shall be 0.5 percent, unless supporting calculations show that there will be no pools or standing water areas formed in the channels at smaller slopes.
- Except for roadside ditches, the side slopes of grassed lined channels without Erosion Control Blankets or Turf Reinforcement Matting shall be no steeper than 3H to 1V.
- Manning's Equation may be used to design open channels and swales where backwater effects created from obstructions and/or tailwater is not present.
- Channels may be designed with multiple stage levels with a low flow section to carry the 2-year storm event and a high flow section to carry storms of larger frequencies.

- Maximum flow velocities shall be determined based on the channel bottom material and bank slope material. Table 3-11 contains an expanded list of permissible velocities for various different types of channel vegetation and slopes.
- Fort Jackson allows vegetated channels. Guidance on the design of these type channels can be found in Haan et. al. (1995) or by using computer software that is capable of calculating for stability and capacity.
- Culvert design shall include all cross drainage facilities that transport storm water runoff under roadways. Culvert selection techniques can range from solving empirical formulas, to using nomographs and charts, to comprehensive mathematical analysis for specific hydraulic conditions. The many hydraulic factors involved make precise evaluation time consuming and difficult without the help of computer programs and models. The actual models used for these calculations shall be at the discretion of the design professional with approval from Fort Jackson. Designs shall be based upon SCDOT requirements where applicable. The following criteria shall be followed:
  - All cross-drain culverts shall be designed to pass the 25-year 24-hour design storm event without overtopping the road.
  - All interior culverts shall be designed to pass the 10-year 24-hour design storm event without overtopping the road.
  - Additional hydraulic capacity shall be required as necessary to prevent backwater effects that may adversely impact upstream property or structures.
  - Acceptable models for designing culverts include, but are not limited to:
    - HY8
    - SEDCAD4
    - Pond Pack
    - HEC-RAS
    - Culvert Master

**Table 3-11: Maximum permissible velocities for vegetated channels**

Cover	Permissible Velocity (ft./sec.)*					
	Erosion Resistant Soils % Slope			Easily Eroded Soils % Slope		
	0-5	5-10	> 10	0-5	5-10	> 10
Bermuda Grass	8	7	6	6	5	4
Bahia						

Cover	Permissible Velocity (ft./sec.)*					
	Erosion Resistant Soils			Easily Eroded Soils		
	% Slope			% Slope		
	0-5	5-10	> 10	0-5	5-10	> 10
Buffalo Grass						
Blue Gamma						
Centipede Grass	7	6	5	5	4	3
Tall Fescue						
Kentucky Bluegrass						
Red Canary Grass						
Grass-legume Mixture	5	4	NR	4	3	NR
Lespedeza Sericea						
Weeping Lovegrass						
Kudzu						
Alfalfa	3.5	NR	NR	2.5	NR	NR
Small Grains						
Temporary Vegetation						

\* Allow velocities over 5 ft/sec only where good cover and maintenance will be provided. If poor vegetation exists due to shade, climate, soils or other factors, the permissible velocity shall be reduced by 50 percent.

NR = Not Recommended

Sources: Elementary Soil and Water Engineering, Shwab et. al. and Hann et. al. (1995)

### 3.3.3.8 100-Year Floodplain

The goal of this section of the Handbook is to provide an overview of the requirements and procedures for proposed land development occurring in the 100-year floodplain (floodplain). Development is defined as any manmade change to improved or unimproved property including, but not limited to, buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations.

#### 3.3.3.8.1 Floodplain policy

The provisions in this section apply to all development in areas of special flood hazard identified by the Federal Insurance Administration in its Floodway Boundary Map and Flood Insurance Rate Maps Community #450079C, panels 0113G, 0115G, 0120G, 0150G, 0176G, 0177G, 0185G, dated January 19, 1994, panel 0110H, dated February 20, 2002, and any revisions thereto.

It is the purpose of this section to promote the public health, safety and general welfare and to minimize losses due to flood conditions in specific areas by provisions designed to:

- Restrict or prohibit uses that are dangerous to health, safety and property due to water or erosion in flood heights or velocities.

- Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- Control the alteration of natural floodplains, stream channels and natural protective barriers, which are involved in the accommodation of floodwaters;
- Control filling, grading, dredging and other development which may increase erosion or flood damage; and
- Prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

#### **3.3.3.8.2 Floodplain standards**

The following is a general summary of the provisions of FEMA:

- Development within the limits of a floodplain can not cause an increase of the level of the base flood. If such increase is anticipated, then the applicant must submit an application for a Conditional Letter of Map Revision (CLOMR) to Fort Jackson and FEMA.
- If an adverse effect is determined, engineering justification by the use of hydraulic computer models and compensatory storage at hydraulically equivalent sites for the proposed development shall be required.
- No structures are allowed within the floodway or adopted regulatory floodplain in Unnumbered A Zones unless acceptable engineering justification is provided.
- There is a 1-foot freeboard requirement on all new construction and substantial improvements within the 100-year floodplain.
- All new construction or substantial improvements shall be constructed on properly designed and compacted fill (ASTM D-698 or equivalent) that extends beyond the building walls before dropping below the base flood elevation and has appropriate protection from erosion and scour. The design of the fill or the fill standard must be approved by a registered engineer or meet the engineered support requirements similar to those for V-Zones (as set out in 44 CFR 60.3 (e)(4)).
- All new and replacement water supply and sanitary sewer systems must be designed to minimize or eliminate infiltration into the system.

#### **3.3.3.8.3 Floodplain study general criteria**

All floodplain studies shall follow the guidelines and procedures as set forth by FEMA and Fort Jackson. The general criteria and requirements have been established to help clarify the procedures related to performing a floodplain study in Fort Jackson are as follows:

- The project must be consistent with applicable State and Federal regulations,
- A professional engineer registered in the State of South Carolina shall prepare all studies,
- The following hydraulic computer models for floodplain development on Fort Jackson are recommended but are not limited to:
  - HEC-RAS and
  - WSPRO,
- The floodplain analysis shall include the 10-, 50-, 100-, and 500-year, 24-hour storm events,
- Hydrologic analyses should utilize the current land use conditions based on the most updated data within the desired watershed (FEMA only allows for consideration of existing conditions in the watershed; Fort Jackson can require particular models to be based on built-out conditions for its own purposes, but FEMA will not accept these future conditions in the FEMA submittal),
- Volume as well as peak flow shall be evaluated,
- Limits of the 100-year floodplain for the pre-development and post-development conditions shall be shown on the site plan,
- Backwater conditions, local obstructions, bridges, culverts, and storm water conveyance systems shall be considered,
- Digital data shall have the following characteristics:
  - horizontal datum: NAD83 (1986),
  - coordinate system: UTM Zone 17,
  - vertical datum: NAVD88, and
  - units: international feet,
- Data capture methods must result in new data meeting national horizontal and vertical accuracy standards, which are scale dependent. Horizontal accuracy standards are approximately (+/-) 2.5-feet, +/- 5.0-feet, and (+/-)10.0-feet, respectively for each mapping scale. Vertical accuracy is (+/-) one half of the contour interval for a given area.
- All proposed work within Unnumbered A zones must be accompanied by hydrologic and hydraulic modeling.

- Calculated flood boundaries shall be submitted in a digital format that is compatible with Fort Jackson's GIS data.

#### **3.3.3.8.4 Floodplain study submittal criteria**

Each permit must include:

- Applicants name
- Location where the work will be done

A type of development must be chosen. If the work being done falls into "other", please elaborate in the comments section.

Under "Flood Zone" all properties that have floodplains must check either "No. A or A Zone". The No. A zones are floodplain areas that have had a detailed study performed and a base flood elevation is known. The base flood elevation in A zones have been approximated.

Under "Location in relation to Floodway/Floodplain", all properties that have floodplains must chose "inside adopted floodplain". In the comments section, if the work to be done includes a structure, make a note as to whether the structure is located within the floodplain.

The application must be signed and stamped by a South Carolina Registered Engineer, Surveyor, or other qualified Federal Government employees and the applicant must sign the application.

Hydrologic and hydraulic analyses must be contained in a report describing the study methodology, a listing of all assumptions (e.g., rationale for Manning's 'n' values, reasons for revising hydrology, source of topographic information and land use), bridge and cross section data, and a brief description of the project.

All projects being submitted to FEMA must have a completed FEMA MT-1 or MT-2 form as appropriate. These forms can be obtained from the following.

**FEMA website**

[www.fema.gov](http://www.fema.gov)

**FEMA Region IV**

3003 Chamblee Tucker Road  
Atlanta, Georgia 30341  
(770.220.5400)

**The South Carolina Department of Natural Resources**

Flood Mitigation Program  
2221 Devine Street, Suite 222  
Columbia, South Carolina 29205  
(803.734.9103)

### **3.3.4 Storm Water Facility Ownership and Maintenance**

#### **3.3.4.1 Ownership**

All permanent storm water management facilities shall be owned and maintained by Fort Jackson.

#### **3.3.4.2 Maintenance**

A permanent maintenance plan for each permanent storm water management facility shall be included in the Final SWMP. This will allow Fort Jackson to plan and coordinate future maintenance activities.

## **3.4 Plan Submittal, Review, and Approval Process**

### **3.4.1 Plan Submittal**

When the Fort Jackson receives the initial Submittal Package, it shall be reviewed by a certified plan reviewer for compliance. After the plans have been reviewed to determine compliance with the regulations set forth by this Handbook, the plan reviewer will contact the applicant/design professional and request any necessary changes, or notify the applicant/design professional that the plans are in compliance.

### **3.4.2 Plan Review Period**

The Storm Water Concept Plan may be reviewed if needed with the designer and will be approved, approved with changes, or rejected.

Upon approval of the Storm Water Concept Plan and receipt of the Final SWMP, a complete Submittal Package is to be submitted, after which, Fort Jackson shall accomplish its review and have either the approval or review comments transmitted to the applicant.

Fort Jackson shall conduct its review of a waiver or variance submitted by the applicant within twenty (20) working days of the submittal. Failure of Fort Jackson to act on the waiver by the end of this period will result in the automatic approval of the waiver.

### **3.4.3 Incomplete Storm Water Management Permit Applications**

Engineering design plans, permit applications, specifications, and submittal packages submitted to Fort Jackson that do not meet the minimum requirements of this Handbook shall be handled in the following manner:

- If the original Submittal Package has all of the major components in accordance with Chapter 3 but is missing some information, a written notice will be sent to the applicant.
- The written notice from Fort Jackson shall state the following:

- the specific information that must be re-submitted to Fort Jackson in order for the permit application to be considered complete for review and processing,
  - the Submittal Package has been removed from the review process,
  - re-submittal of the Submittal Package with all of the required modifications shall return the application to the review process.
  - Fort Jackson shall hold the incomplete plan for a period of 60 working days from the date of the written notice.
- If an adequate response is not received within 60 working days, the submittal shall be rejected, and the entire submittal process must be initiated again.

If the original Submittal Package does not contain the major required components, it shall be returned to the applicant for re-submittal without review.

### **3.4.4 Plan Approval and Final Submittal**

When the plans have been determined to be in compliance, then the applicant/design professional shall send four (4) additional copies of the Submittal Package to Fort Jackson for final approval to Fort Jackson.

Approved plans remain valid for two (2) calendar years from the date of approval. Extensions or renewals of the approved plans shall be granted by Fort Jackson upon written request by the person responsible for the land disturbing activity.

The Final SWMP shall not be considered approved without an approval stamp with a signature and date on the plans by Fort Jackson. The stamp of approval on the plans is solely an acknowledgement of satisfactory compliance with the requirements of the MOI. The approval stamp does not constitute a warranty to the applicant or any other person concerning safety, appropriateness or effectiveness of any provision, or omission from the Final SWMP.

Approvals of land disturbing activities that were approved prior to the effective date of this Handbook shall remain in effect for the original term of the approval. For land disturbing activities which were not initiated during the original term of approval, the person responsible for the land disturbing activity shall re-submit the Final SWMP to Fort Jackson for review and approval subject to the requirements of this Handbook.

#### **3.4.4.1 Notification of work**

The contractor shall provide a written Notification of Work (NOW) to Fort Jackson on the planned commencement of construction a minimum of 48-hours prior to the commencement. See the Section 1.7 for contact information.



A Stop Work Order shall be issued on all projects proceeding without the required NOW approval.

### **3.5 Construction Requirements**

The responsibility and importance of contractors in land disturbance activities should not be overlooked and considered secondary. The contractor's adherence or lack thereof to the approved SWMP is instrumental in the protection of the existing hydrologic and hydraulic features. Several contractor related issues that should be addressed in the SWMP are listed below.

- If necessary, slopes which exceed eight (8) vertical feet should be stabilized with Erosion Control Blankets (ECBs) or Turf Reinforced Mats (TRMs), in addition to hydroseeding. It may be necessary to install temporary slope drains during construction. Temporary berms may be needed daily until the slope is brought to grade
- Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than fourteen (14) days after work has ceased, unless activity in that portion of the site will resume within twenty-one (21) days.
- All sediment and erosion control devices shall be inspected every seven (7) days or after each rainfall occurrence that exceeds one-half (0.5) inch. Damaged or ineffective devices shall be repaired or replaced, as necessary. The contractor shall maintain a log of these inspection reports on site and should send copy of these reports to appropriate Fort Jackson personnel.
- Provide silt fence and/or other control devices, as may be required, to control soil erosion during utility construction. All disturbed areas shall be cleaned, graded, and stabilized with grassing immediately after the utility installation.
- All erosion control devices shall be properly maintained during all phases of construction until the completion of all construction activities and all disturbed areas have been stabilized. Additional control devices may be required during construction in order to control erosion and /or offsite sedimentation. All temporary control devices shall be removed once construction is complete and the site is stabilized.
- The contractor must take necessary action to minimize the tracking of mud onto the paved roadway from construction areas. The contractor shall daily remove mud/soil from pavement, as may be required.

### **3.5.1 Deviations from Approved Plans**

Substantial deviations from the approved site development plans and specifications shall not be made on-site without written approval from Fort Jackson. Realistically and practically, there are always minor variations to the proposed plan during land development activities. These minor variations will be allowable without the need for approval from Fort Jackson, though sound engineering judgement should be exercised in assessing the impacts of these minor changes.

Examples of substantial deviations that would require written approval from Fort Jackson include, but are not limited to the following:

- pipe size changes,
- pipe grade changes that will affect the hydraulic capacity of the storm water facilities,
- the movement of storm water facility that would put them outside of specific easements and right-of-ways, and
- changes in grade on the site which would effect the direction of storm water flows, flow velocities, flow volumes, or other hydrologic impacts that would cause the existing plans to fail in protecting water quantity and water quality impacts.

### **3.5.2 As-Built Requirements**

The permittee shall submit an as-built plan certified by a registered professional to Fort Jackson upon the completion of the construction of the storm water management control structures submitted in the Final SWMP. The registered professional shall certify the following:

- the facilities have been constructed as shown on the as-built plans and
- the facilities meet the approved site plan and specifications or achieve the function they were designed to perform.

Acceptable as-built plans shall be submitted prior to the use or occupancy of site. Fort Jackson may perform a final inspection upon completion of the installation of storm water management structures to determine if the work is completed and constructed in accordance with the Final SWMP.

## **3.6 Application Fees**

Permits authorized by the provisions of this Handbook shall be effective only upon the payment of the appropriate fees, all of which will go to the State. A fee is required for all activities disturbing one acre or more on Fort Jackson. There is no charge for projects that disturb less than one acre. The fee is \$100.00 per disturbed acre, with a \$2000.00 maximum.

Any land disturbing project disturbing one or more acres must obtain either NPDES general permit coverage or an NPDES permit. There is an additional NPDES fee for these projects. There are no exemptions from this fee, therefore State and Federal entities must submit the NPDES fee as part of their Submittal Package. The NPDES fee is \$125.00.

The maximum fee for both is \$2125.00.

### **3.7 Stormwater Controls: Installation, Inspection, and Maintenance**

The post-construction storm water quality control BMPs shall be constructed and implemented in compliance with this Handbook and approved plans that are functioning as intended. Fort Jackson will perform inspections of BMPs to ensure proper functions based on maintenance schedules developed in the SWMP and approved by Fort Jackson. All maintenance activities and inspections shall be the responsibility of Fort Jackson. If inspection reports that the stormwater control is not functioning as expected within one year after construction activities have concluded, the contractor/design professional shall be required to correct the problem. Most deficiencies should be corrected within a short time period, but allowances will be made for more serious problems.

All constructed storm water quality BMPs shall require an as-built certification to ensure proper size and water quality volume. All pre-fabricated storm water quality BMPs shall require a manufacturer's certification that the correct structure is installed properly.

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## **APPENDIX A**

### **MEMORANDUM OF INSTRUCTION**

ATZJ-GC

15 December 1999

## MEMORANDUM OF INSTRUCTION

SUBJECT: Land Disturbing Activities on Fort Jackson

1. The Stormwater Management and Sediment Reduction Act of South Carolina requires a stormwater management and sediment reduction plan before any person can conduct any "land disturbing activity." A "land disturbing activity" is defined as any use of the land by any person that results in a change in the natural cover or topography that may cause erosion and contribute to sediment and alter the quality and quantity of stormwater runoff.

2. The South Carolina Department of Health and Environmental Control (SCDHEC) has issued a General Permit to Fort Jackson authorizing land disturbing activities on Fort Jackson in accordance with this Memorandum of Instruction (MOI). No land disturbing activity shall be conducted on Fort Jackson except as authorized by this MOI, except for the activities described in R.72-302.A (1) and (2), in Enclosure 1. All other activities described in R.72-302.A are subject to the requirements of this regulation. **The use of this general permit does not relinquish a land disturbing activity from requirements of the South Carolina Stormwater Management and Sediment Reduction regulations.**

3. This MOI summarizes the Fort Jackson procedure for compliance with the General Permit and identifies the minimum standards and design specifications for land disturbing activities.

4. Activities Requiring Written Approval: All land disturbing activities, except routine activities described in Enclosure 2, require written approval of the Fort Jackson Directorate of Logistics and Engineering, Public Safety and Environmental Services Division (DLE, PSESD). In addition, land disturbances of five (5) acres or greater also require coverage under the Clean Water Act National Pollutant Discharge Elimination System (NPDES).

5. The approval procedure is as follows:

a. For activities involving two (2) acres or less of actual land disturbance and which are not part of a larger common plan of development, a simplified stormwater management and sediment control plan meeting the requirements of R.72-307H in Enclosure 1, and the application form found in Enclosure 4 shall be submitted to PSESD. This plan does require approval by PSESD, but does not require preparation or certification by a registered engineer, landscape architect, or Tier B land surveyor. Both PSESD and SCDHEC staff have the authority to conduct site inspections on these projects to insure compliance with the submitted plans. Recurring land disturbance activities described in Enclosure 2 do not require the submission of a management and control plan if the activity is conducted in accordance with the requirements and conditions listed in Enclosures 2 and 5.



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SUBJECT: Land Disturbing Activities on Fort Jackson

b. For activities involving more than two (2) acres and less than five (5) acres of actual land disturbance which are not part of a larger common plan of development, the simplified permitting approval process meeting the requirements of R.72-307I in Enclosure 1 shall be used. All requests shall be submitted to PSESD. Plans and specifications for these activities will be prepared by professional engineers, landscape architects, Tier B land surveyors, or by employees of the federal government within the scope of their employment. No activity shall begin before a request for approval is granted and written approval issued. All contractors and subcontractors whose activities may impact storm water discharges shall sign the appropriate Co-Permittee Agreement found in Enclosure 6.

c. For activities involving more than five (5) acres of actual land disturbance, the requirements of R.72-305 and R.72-307 in Enclosure 1, and the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit #SCR100000, Enclosure 3, are applicable. All requests shall be submitted to PSESD. Plans and specifications for these activities will be prepared by professional engineers, landscape architects, Tier B land surveyors, or by employees of the federal government within the scope of their employment. No activity shall begin before a request for approval is granted and written approval issued. All contractors and subcontractors whose activities may impact storm water discharges shall sign the appropriate Co-Permittee Agreement found in Enclosure 6.

d. Waiver and Variance Procedure. A waiver from stormwater management requirements may be granted for the following reasons:

(1) The disturbed area is returned to a pre-development runoff condition and pre-development landuse is unchanged.

(2) There will be no impacts on the receiving natural waterway or downstream properties.

(3) Stormwater control requirements would aggravate downstream flooding.

(4) Implementing these regulations will cause unnecessary hardship and not fulfill the intent of the regulations.

To be eligible for a waiver, the proponent must submit a written request with descriptions, drawings, and any other information necessary to evaluate the proposal. (See paragraphs 72-302-B and C of the SC Stormwater Management and Sediment Reduction Regulations found in Enclosure 1.)

6. Application Forms and Checklists. Enclosure 4 includes all the necessary application forms and checklists to use in a stormwater management and sediment reduction permit submittal

package. Reproduction of the forms is authorized.

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SUBJECT: Land Disturbing Activities on Fort Jackson

7. Plan Submittal and Approval. The applicant should do a preliminary analysis to determine which of the different categories a project would fall under and then submit the appropriate application form and information required on the checklist. The initial submittal package should include only one (1) paper copy of the stormwater management and sediment reduction plans and corresponding calculations. TR-55, Rational, HEC-1, HEC-HMS, SITES, TR-20, or Chapter 2 of the Natural Resources Conservation Service Engineering Field Manual (EFM2) will be used to calculate stormwater runoff. Any other hydrology program must be approved by the installation Civil Engineer. After the plans have been reviewed to determine compliance with this MOI, the PSESD plan reviewer will contact the proponent and request necessary changes or notify the individual that the plans are in compliance. When the plans have been determined to be in compliance, the plan reviewer will specify the number of copies to be submitted for approval. As a guide, the proponent shall send four (4) additional paper copies for stamp approval. One copy of the plans is for the engineer, one is for the organization, one is for the contractor and must be available onsite at all times, and one is for the PSESD inspector. Each copy will be stamped and signed to signify approval.

8. NPDES General Permit.

a. Any construction project disturbing five (5) acres or greater must obtain either NPDES General Permit coverage or an individual NPDES permit. NPDES General Permit coverage under SCR100000 can be obtained by preparing an application form DHEC 2612 (2/97) Stormwater Notice of Intent (NOI)(enclosure 4). The completed and signed NOI should be submitted to SCDHEC along with payment of a \$125.00 administration fee (see paragraph 12). PSESD will not issue a permit until a copy of the NOI and payment documentation is submitted to PSESD. After the construction project is completed and all disturbed areas are stabilized, submit a Notice of Termination (NOT) (enclosure 4) to PSESD. PSESD will then forward the NOT to SCDHEC.

b. If a project has a disturbed acreage of five (5) acres or more and is exempt from the requirements of the Stormwater Management and Sediment Reduction Act of South Carolina (see R.72-302 in Enclosure 1, but not exempt from the requirements of SCR100000 pursuant to South Carolina Regulation 61-9, then a completed and signed NOI must still be submitted to DHEC along with payment of a \$125.00 administration fee (see paragraph 12). Submit a copy of the NOI and payment documentation to PSESD.

9. Co-permittee Agreement. All construction contractors and subcontractors involved in land disturbing activities shall sign the applicable co-permittee agreement found in Enclosure 6.

10. Notification of Initiation of Land Disturbance Activity and Final Inspection. The

organization/contractor shall notify the PSESD inspector of the date for commencement of the ATZJ-GC

#### Land Disturbing Activities on Fort Jackson

activity and the name of the contact person prior to commencement. Notification of completion of the stormwater management system will also be provided. These notices can be sent by FAX (803-751-6821) or by e-mail message (allend@jackson.army.mil).

11. Final Regulations. Enclosure 1 is the official regulation concerning stormwater management and sediment reduction.. This regulation contains the specific requirements for developing stormwater management and sediment reduction plans.

12. Fees. There are no fees in conjunction with applications filed with or approvals issued by PSESD. However, there is a \$125 administration fee for the NPDES NOI for land disturbing activities greater than 5 acres. This fee is payable to DHEC, ATTN: Mr. Harvey Daniel, Bureau of Water, 2600 Bull Street, Columbia, SC, 29201.

13. Inspections, Violations, and Compliance. PSESD staff will conduct periodic site inspections on all land disturbing activities to accomplish the following items:

- a. Ensure that the approved stormwater management and sediment control plans are on the project site and are in compliance.

- b. Ensure that every active site is inspected for compliance with the approved plan on a regular basis.

- c. Prepare a written report after every inspection. The inspection form is located at Enclosure 7.

- d. Notify the organization/contracting officer in writing when violations are observed, describing the nature of the violation, required corrective action, and the time period for correction of the violation.

- e. If the proponent does not take necessary corrective action, then the proponent will be notified in writing, first by the Director of Logistics of Engineering (DLE). If corrective action is not completed within the specified time frame, the proponent will be notified in writing by the Garrison Commander. If corrective action is still not completed, either the proponent will be notified in writing by the Commanding General of Fort Jackson or the matter will be turned over to DHEC.

- f. Inspections may also be conducted by SCDHEC staff at their discretion or as the result of a complaint. (See Sections 72-308D-3, 72-312(E), (F), (I), and (J) of the SC Stormwater Management and Sediment Reduction Regulations found in Enclosure 1.

ATZJ-GC

Land Disturbing Activities on Fort Jackson

14. Complaint Procedure. Any person, including any adjacent landowner or governmental body, may direct any complaint or allegation of a violation of this MOI, in writing, to Commander, USATC & Fort Jackson, ATTN: ATZJ-DLE-PS, Fort Jackson, South Carolina, 29207, with a copy to Commander, USATC & Fort Jackson, ATTN: ATZJ-SJA-ILS, Fort Jackson, South Carolina, 29207. The PSED shall investigate the complaint and respond to the complainant within 48 hours of receipt of the complaint. If a solution cannot be reached, the person may forward the complaint to SCDHEC for review. (See sections 72-308 and 72-314 of the SC Stormwater Management and Sediment Reduction Regulations found in the handbook at Enclosure 1, Appendix A.)

15. Any other federal, state, or local permits shall be obtained as required. These may include, but are not limited to: Federal Emergency Management Agency, SCDHEC – Dams and Reservoir Safety Section, SCDHEC – Water Quality Division for 401 Certification, U.S. Army Corps of Engineers – Section 404 Permits. These requirements will be issued by PSED in the Memorandum of Environmental Approval (MOEA).

FOR THE COMMANDER:

7 Enclosures

“ORIGINAL SIGNED BY:”

LARRY M. KEETON

COL, SC

Garrison Commander

## **APPENDIX B**

### **FORT JACKSON LAND DISTURBANCE APPLICATION FORM**



# United States Army Training Center Fort Jackson, South Carolina

POC in DLE, PSES is:  
Doyle Allen  
(803)751-7232  
allend@jackson.army.mil

## APPLICATION FORM FOR LAND DISTURBING ACTIVITIES FORT JACKSON, SOUTH CAROLINA

DA, HQ, USATC & Fort Jackson  
ATZJ-DLE-ENRD (Doyle Allen)  
2563 Essayons Way  
Fort Jackson, SC 29207-5670

PROJECT NAME \_\_\_\_\_ DATE: \_\_\_\_\_

APPLICANT (organization requesting the project) \_\_\_\_\_  
POC \_\_\_\_\_ TELEPHONE \_\_\_\_\_ Email: \_\_\_\_\_

LOCATION (also show on a location map) \_\_\_\_\_

ORGANIZATION RESPONSIBLE FOR IMPLEMENTING STORMWATER/EROSION CONTROL PLAN (this could be Roads and Grounds, Corps of Engineers, National Guard Engineering unit, private contractor, etc. - whoever will be constructing stormwater and erosion control measures)

ORGANIZATION \_\_\_\_\_  
POC \_\_\_\_\_ TELEPHONE \_\_\_\_\_ Email: \_\_\_\_\_

WHO WILL BE RESPONSIBLE FOR SITE INSPECTION? (this should be the field person the PSES inspector can call if there is a problem - the person directing the day to day activities of the project; this might be a Corps of Engineers project manager, a Job Order Contract (JOC) inspector, or someone from Roads and Grounds)

POC \_\_\_\_\_ TELEPHONE \_\_\_\_\_ E-mail: \_\_\_\_\_

CONTRACTOR OR OPERATOR (if known) \_\_\_\_\_

POC \_\_\_\_\_ TELEPHONE \_\_\_\_\_ E-mail: \_\_\_\_\_

TOTAL ACRES OF LAND DISTURBANCE \_\_\_\_\_

FEES FOR LAND DISTURBANCES OF 5 ACRES OR GREATER, A \$125 NPDES ADMINISTRATION FEE IS REQUIRED (payable to South Carolina Department of Health and Environmental Control (DHEC), ATTN: Harvey Daniel, 2600 Bull Street, Columbia, SC 29201)

ANTICIPATED: START DATE \_\_\_\_\_ COMPLETION DATE \_\_\_\_\_

Attach Stormwater Management and Sediment Reduction Plan/Pollution Prevention Plan

### (HIGHLIGHTED AREAS TO BE FILLED IN BY PSES STAFF)

Record of Environmental Consideration (REC) Number \_\_\_\_\_

NEAREST RECEIVING WATERBODY \_\_\_\_\_

DISTANCE TO NEAREST RECEIVING WATERBODY \_\_\_\_\_

LATITUDE \_\_\_\_\_ LONGITUDE \_\_\_\_\_ SIC CODE \_\_\_\_\_

Any wetlands on the project site? \_\_\_\_\_ If so, delineate on a map. USGS Topo \_\_\_\_\_

I hereby certify that all land disturbing construction and associated activity pertaining to this site shall be accomplished pursuant to and in keeping with the terms and conditions of the approved plans. I also certify that a responsible person will be assigned to the project for day to day control. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting **false information, including the possibility of fine and imprisonment for knowing violations**

*(To be signed by a person who is financially responsible and/or who has the authority to ensure that the stormwater/erosion control plan is implemented. Design engineers may not sign here. Contractors should sign a Co-permittee Agreement)*

\_\_\_\_\_  
PRINTED NAME

\_\_\_\_\_  
SIGNATURE

**DESIGNER CERTIFICATION** (as applicable) – One copy of the plans, all specifications and supporting calculations, forms, and reports are herewith submitted and made a part of this application. I have placed my signature and seal on the design documents submitted signifying that I accept responsibility for the design of the system. Further, I certify to the best of my knowledge and belief that the design is consistent with the requirements of Title 48, Chapter 14 of the Code of Laws of SC, 1976 as amended, and pursuant regulation 72-300.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
PRINTED NAME

\_\_\_\_\_  
SC REGISTRATION NUMBER

Engineer ☐ Tier b land surveyor ☐ Landscape architect ☐ Federal government employee ☐

#### FOR INTERNAL USE ONLY

I hereby certify that I have thoroughly reviewed the application, plans and supporting documents and found them to be in compliance with the letter and the intent of the law. This stamp of approval on the plans is solely an acknowledgement of satisfactory compliance with the requirements of these regulations. The approval stamp does not constitute a representation or warranty to the applicant or any other person concerning the safety, appropriateness of effectiveness of any provisions, or omission from the stormwater and sediment plan.

\_\_\_\_\_  
FJ PLAN REVIEWER

\_\_\_\_\_  
FJ HYDROLOGY REVIEWER

## **APPENDIX C**

### **FORT JACKSON LAND DISTURBANCE SUBMITTAL SUMMARY FORM**



**DATE:**

## Fort Jackson Land Disturbance Handbook Submittal Summary Form

The purpose of this document is to provide reviewers from Fort Jackson's DLE-ENRD and SCDHEC with a summary of the proposed land disturbance activities and the design process. When necessary, all information provided in this summary should be substantiated with detailed calculations.

### I. General Information

<b>Project Name:</b>	
<b>Company Name:</b>	
<b>Engineer (P.E.) Name:</b>	
<b>Project Narrative:</b>	
<b>Description of Existing Drainage Patterns:</b>	
<b>Description of Proposed Drainage Patterns:</b>	
<b>Completed SCDHEC land disturbance application forms:</b>	<input type="checkbox"/>
<b>2 complete sets of construction documents:</b>	<input type="checkbox"/>
<b>Payment for all necessary fees:</b>	<input type="checkbox"/>
<b>Location map(s) of project (should include necessary FIRMs):</b>	<input type="checkbox"/>
<b>Topographic map of project:</b>	<input type="checkbox"/>
<b>Wetlands delineation on construction documents:</b>	<input type="checkbox"/>
<b>Detention waiver:</b>	<input type="checkbox"/>
<b>Identification of all other above and below ground utilities:</b>	<input type="checkbox"/>

**II. Watershed Information**

Add a watershed

Delete a watershed

Watershed ID	Watershed area (ac)	Soil Type(s)	Land use(s)	Area-weighted Runoff factor (CN/C)	Time of concentration (min)
<b>Pre-Development Conditions</b>					

Add a watershed

Delete a watershed

<b>Post-Development Conditions</b>					

<b>Methodology used:</b>	
<b>Models used:</b>	

**III. Hydrologic Information**

Add a watershed

Delete a watershed

Watershed ID	First-flush (cfs)	2-yr peak runoff (cfs)	10-yr peak runoff (cfs)	25-yr peak runoff (cfs)	100-yr peak runoff (cfs)
<b>Pre-Development flows</b>					

Add a watershed

Delete a watershed

<b>Post-Development flows</b>					

<b>Methodology used:</b>	
<b>Model(s) used:</b>	

**VI. Storm Sewer Design Information**

Add a watershed

Delete a watershed

Design Point ID	Rim elevation (MSL ft)	Flow rate into pipe (cfs)	Pipe Diameter (in)	Invert in (MSL ft)	Invert out (MSL ft)	Pipe length (ft)	Pipe Slope (ft/ft)	Flow Velocity (fps)	HGL

Methodology used:	
Model(s) used:	

**V. Channel Design Information**

Add a structure

Delete a structure

Structure ID	Flow rate (cfs)	Manning's n	Channel Slope (ft/ft)	Left Side Slope (ft/ft)	Right Side Slope (ft/ft)	Channel length (ft)	Velocity (ft/s)

Methodology used:	
Model(s) used:	

**VI. Erosion Prevention & Sediment Control Design Information**

Add a structure

Delete a structure

Structure ID	Type	Effective Area (ft <sup>2</sup> )	Purpose	% TSS removal

Methodology used:	
Model(s) used:	

**VII. Detention/Retention Facility Design Information**

Add a Structure

Add a stage

Delete a stage

Structure ID	Stage (ft)	Surface Area (ft <sup>2</sup> )	Storage (ac-ft)	Discharge (cfs)	WQCV (ft <sup>3</sup> )	WQ Discharge (cfs)	Outlet Type

Methodology used:	
Model(s) used:	

**VIII. Water Quality/BMP Design Information**

Add a BMP

Delete a BMP

Structure ID	Volume (ft <sup>3</sup> )	Pollutant #1	% removal	Pollutant #2	% removal	Other Pollutants	% removal(s)

Methodology used:	
Model(s) used:	

**IX. Culverts**

Add a structure

Delete a structure

Structure ID	Flow rate in pipe (cfs)	Height * Width (in)	Invert in (MSL ft)	Invert out (MSL ft)	Culvert length (ft)	Flow Velocity (fps)	Material and Class	Wing-wall (Y/N)	Head-wall (Y/N)

Methodology used:	
Model(s) used:	

**X. Maintenance Schedules**

Add a structure

Delete a structure

Structure ID	Activity #1	Frequency (#/yr)	Activity #2	Frequency (#/yr)	Activity #3	Frequency (#/yr)

**APPENDIX D**

**BMP USAGE GUIDANCE**

## EROSION PREVENTION BMP SUGGESTED USES

BMP	Design Manual Section	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Erosion Prevention Measures	8.4	X	X	X	X	X	X	X
Surface Roughening	8.4.1	X		X				
Bench Terracing	8.4.2	X		X				
Temporary Seeding	8.4.3	X		X		X	X	X
Mulching	8.4.4	X				X	X	
Erosion Control Blankets and Turf Reinforcement Mats	8.4.5	X	X	X			X	
Final Stabilization	8.4.6	X		X		X		X
Topsoiling	8.4.6.1			X		X		
Permanent Seeding and Planting of Grasses	8.4.6.2	X		X		X		X
Permanent Ground Cover Plants	8.4.6.3	X		X				X
Sodding	8.4.6.4	X		X		X		X
Riprap or Aggregate	8.4.7	X	X	X				
Outlet Protection	8.4.8		X		X			X
Dust Control	8.4.9					X	X	X
Polyacrylamide (PAMs)	8.4.10	X		X	X	X	X	X

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## TEMPORARY SEDIMENT CONTROL BMP SUGGESTED USES

BMP	Design Manual Section	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Temporary Sediment Control Structures	8.5	X	X	X	X	X	X	X
Storage Volumes and Maintenance Schedules	8.5.1		X		X			X
Temporary Sediment Basin	8.5.2		X	X	X			X
Multipurpose Basin	8.5.3		X	X	X			X
Temporary Sediment Trap	8.5.4		X	X				X
Silt Fence	8.5.5	X	X					X
Rock Ditch Check	8.5.6			X				X
Stabilized Construction Entrance	8.5.7					X		X
Storm Drain Inlet Protection	8.5.8		X		X			X
Vegetated Filter Strips	8.5.9		X					X
Rock Sediment Dike	8.5.10		X	X				X



## RUNOFF CONTROL AND CONVEYANCE BMP SUGGESTED USES

BMP	Design Manual Section	Slope Protection	Waterway Protection	Surface Protection	Enclosed Drainage	Large Flat Areas	Borrow Areas	Adjacent Properties
Pipe Slope Drains	8.6.1	X		X				
Temporary Stream Crossing	8.6.2		X	X				X
Runoff Conveyance Measures	8.6.3	X					X	X
Construction De-watering	8.6.4		X		X	X	X	
Level Spreader	8.6.5			X		X		X
Subsurface Drains	8.6.6			X		X		

## STRUCTURAL STORMWATER QUALITY BMP SUGGESTED USES

BMP	Design Manual Section	Land Requirement	Single Family	Multi Family	Low Density Commercial	High Density Commercial	Low Density Industrial	High Density Industrial
Wet Storm Water Ponds	9.8.1.2	MODERATE - HIGH	X	X	X	X	X	X
Wet Extended Pond	9.8.1.2	MODERATE - HIGH	X	X	X	X	X	X
Micropool Extended Pond	9.8.1.2	MODERATE - HIGH	X	X	X		X	
Shallow Wetland	9.8.1.3	MODERATE - HIGH	X	X	X		X	
Extended Detention Shallow Wetland	9.8.1.3	MODERATE - HIGH	X	X	X		X	
Pond/Wetland System	9.8.1.3	MODERATE - HIGH	X	X	X		X	
Pocket Wetland	9.8.1.3	MODERATE	X	X		X		X
Bioretention Areas	9.8.1.4	MODERATE	X	X	X	X	X	X
Sand Filtration Facilities	9.8.1.5	LOW			X	X	X	X
Infiltration Trenches	9.8.1.6	MODERATE	X	X	X	X	X	X
Enhanced Dry Swales	9.8.1.7	HIGH	X	X	X		X	
Pre-Fabricated Control Devices	9.8.1.8	LOW		X	X	X	X	X

## STRUCTURAL STORMWATER QUALITY BMP CHARACTERISTICS

BMP	Design Manual Section	Maintenance Burden	Costs	Aesthetically Pleasing	Provide Habitat	Drainage Area (Acres)	Soils
Wet Storm Water Pond	9.8.1.2	LOW	LOW	X	X	10 MIN 25 PREFERRED	HSG A SOILS MAY REQUIRE POND LINER
Wet Extended Pond with Aquatic Bench	9.8.1.2	LOW	LOW	X	X	10 MIN 25 PREFERRED	HSG B SOILS MAY REQUIRE INFILTRATION TESTING
Micropool Extended Pond	9.8.1.2	MODERATE	LOW	X	X	10 MIN	
Shallow Wetland	9.8.1.3	MODERATE	MODERATE	X	X	20 MIN	
Extended Detention Shallow Wetland	9.8.1.3	MODERATE	MODERATE	X	X	20 MIN	HSG A AND B SOILS MAY REQUIRE LINER
Pond/Wetland System	9.8.1.3	MODERATE	MODERATE	X	X	20 MIN	
Pocket Wetland	9.8.1.3	HIGH	MODERATE	X	X	5 MIN	
Bioretention Areas	9.8.1.4	LOW	MODERATE	X	X	5 MAX	CLAY OR SILTY SOILS MAY REQUIRE PRETREATMENT
Sand Filtration Facilities	9.8.1.5	HIGH	HIGH			5 MAX 2 PREFERRED	
Infiltration Trenches	9.8.1.6	HIGH	HIGH			5 MAX	INFILTRATION RATE > 0.5 IN/HR
Enhanced Dry Swales	9.8.1.7	LOW	MODERATE			5 MAX	PERMEABLE SOIL
Pre-Fabricated Control Devices	9.8.1.8	HIGH	HIGH	X (HIDDEN)		VARIES	NO REQUIREMENT

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## STRUCTURAL STORMWATER QUALITY BMP SUGGESTED USES

BMP	Design Manual Section	Water Quality	Channel Protection	Flood Protection	TSS Removal	Nutrient Removal	Metal Removal	Bacterial Removal
Wet Stormwater Pond	9.8.1.2	X	X	X	HIGH	MODERATE	MODERATE	MODERATE
Wet Extended Pond with Aquatic Bench	9.8.1.2	X	X	X	HIGH	HIGH	MODERATE	MODERATE
Micropool Extended Pond	9.8.1.2	X	X	X	HIGH	MODERATE	MODERATE	NO DATA
Shallow Wetland	9.8.1.3	X	X	X	HIGH	HIGH	MODERATE	HIGH
Extended Detention Shallow Wetland	9.8.1.3	X	X	X	HIGH	HIGH	MODERATE	HIGH
Pond/Wetland System	9.8.1.3	X	X	X	HIGH	HIGH	MODERATE	HIGH
Pocket Wetland	9.8.1.3	X	X		HIGH	HIGH	MODERATE	HIGH
Bioretention Areas	9.8.1.4	X			HIGH	MODERATE	MODERATE	NO DATA
Sand Filtration Facilities	9.8.1.5	X			HIGH	MODERATE	MODERATE	MODERATE
Infiltration Trenches	9.8.1.6	X			HIGH	MODERATE	HIGH	HIGH
Enhanced Dry Swales	9.8.1.7	X			HIGH	MODERATE	MODERATE	LOW
Pre-Fabricated Control Devices	9.8.1.8	X			HIGH	LOW-HIGH	LOW-HIGH	LOW-HIGH

## **APPENDIX E**

### **FORT JACKSON SOIL MAP**

Fort Jackson  
Soils Codes and Hydrologic Soil Groupings



**APPENDIX F**

**STANDARD DRAWINGS**

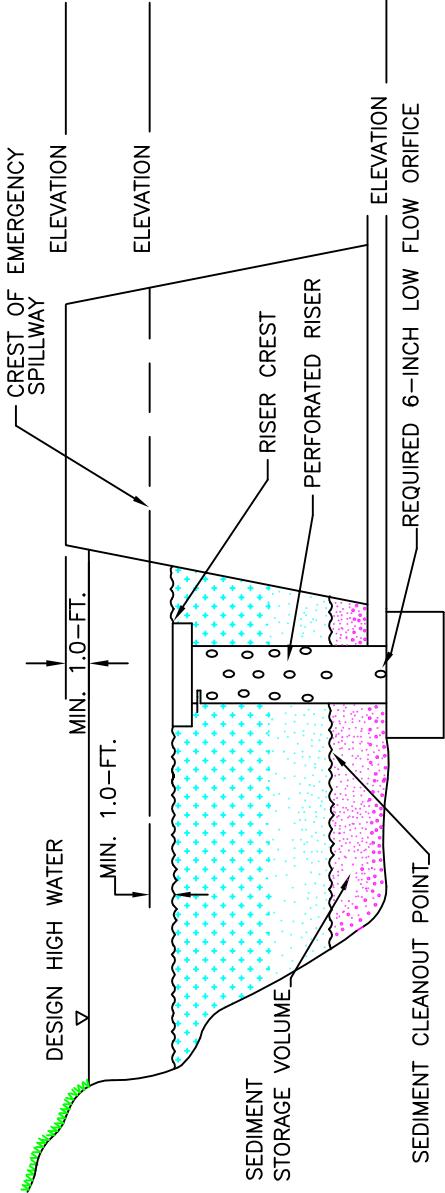
## LIST OF DRAWINGS

### Drawing Title

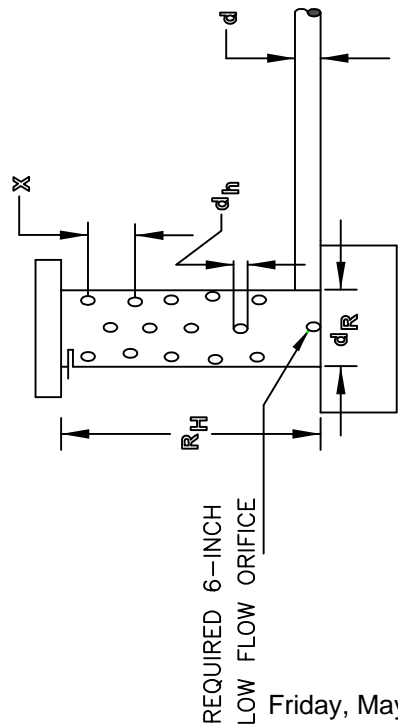
EC-01	Sediment Basin (2 sheets)
EC-02	Sediment Trap (2 sheets)
EC-04	Reinforced Silt Fence (3 sheets)
EC-05	Rock Ditch Check (2 sheets)
EC-06	Stabilized Construction Entrance (3 sheets)
EC-07	Excavated Drop Inlet Protection (2 sheets)
EC-08	Block and Gravel Drop Inlet Sediment Trap (2 sheets)
EC-09	Gravel and Wire Mesh Drop Inlet Protection (2 sheets)
EC-10	Block and Gravel Curb Inlet Protection
EC-11	Gravel Curb Inlet Protection with Sediment Filter
EC-12	Curb Inlet Protection with Wooden Weir
EC-13	Rock Sediment Dike (3 sheets)
EC-14	Pipe Slope Drain (2 sheets)
EC-15	Temporary Stream Low Water Crossing (3 sheets)
EC-16	Diversion Dike or Berm (2 sheets)
EC-17	Diversion Swale (2 sheets)
EC-18	Sandbags
EC-19	Inlet protection socks
EC-20	Sock fence
EC-21	Filter Fabric
SD-01	Anti Vortex
SD-02	Pipe Channel Outlet (2 sheets)
WQ-01	Wet Detention Pond (2 sheets)
WQ-02	Wet Extended Detention Pond (2 sheets)
WQ-03	Micropool Extended Detention Pond (2 sheets)
WQ-04	Storm Water Wetland (2 sheets)
WQ-05	Shallow Wetland (2 sheets)
WQ-06	Extended Detention Shallow Wetland (2 sheets)
WQ-07	Pond/Wetland System (2 sheets)
WQ-08	Pocket Wetland (2 sheets)



WQ-09	Typical Bioretention Area (4 sheets)
WQ-10	Underground Sand Filter (2 sheets)
WQ-11	Infiltration Trench (2 sheets)
WQ-12	Enhances Dry Swale (2 sheets)
WQ-13	LID Parking Lot
WQ-14	BMP Standard Notes

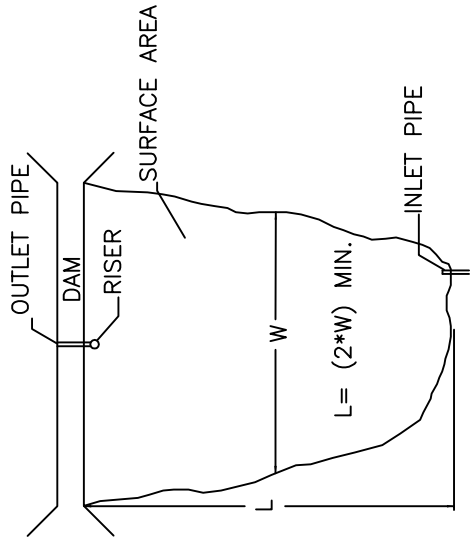


DESIGN ELEVATIONS WITH REQUIRED EMERGENCY SPILLWAY



- $R_H$  = RISER HEIGHT
- $d_R$  = RISER DIAMETER
- $d_h$  = ORIFICE DIAMETER
- $x$  = ORIFICE SPACING
- $d$  = OUTLET PIPE DIAMETER

RISER PIPE DETAIL



PLAN VIEW



## SEDIMENT BASIN

### When and Where to Use It

Sediment Basins should not be placed in waters of the State or USGS blue-line streams (unless approved by Fort Jackson, State, or Federal authorities).

### Inspection and Maintenance:

The key to a functional sediment basin is continual monitoring, regular maintenance and regular sediment removal.

The length to width ratio should be followed. Baffles created from berms or silt fences should be used to obtain a L:W ratio of at least 2.

Attention to sediment accumulations within the pond is extremely important. Sediment deposition should be continually monitored in the basin. Owners and maintenance authorities should be aware that significant concentrations of heavy metals (e.g., lead, zinc, and cadmium) as well as some organics such as pesticides, may be expected to accumulate at the bottom of these treatment facilities.

Remove sediment when it reaches 50% of storage volume or top of the cleanout stake.

Since decomposing vegetation can release pollutants, especially nutrients, captured in the wetpond, it may be necessary to harvest dead vegetation annually. Otherwise the decaying vegetation can export pollutants out of the pond and can cause nuisance conditions to occur.

Regular inspections should be done every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation.

All temporary sediment basins should be removed within 30 days after final site stabilization is achieved or after it is no longer needed.

Trapped sediment should be removed from, or stabilized on site.

Disturbed areas resulting from the removal of the sediment basin should be permanently stabilized.





# Fort Jackson Land Disturbance Handbook

## SEDIMENT TRAP

STANDARD DRAWING NO. EC-02 Page 1 of 2

## EMBANKMENT AND SPILLWAY ELEVATION

## SEDIMENT TRAP

### When and Where to Use It

Sediment traps should not be placed in waters of the State or USGS blue-line streams (unless approved by Fort Jackson, State, or Federal authorities).

### Installation:

#### Rock Outlet Structure Requirements:

The maximum sediment trap height shall be 5–feet.  
 The maximum stone height of the outlet weir shall be 3.5–feet.  
 The minimum bottom flow width of the structure shall be 3–feet.  
 The minimum top flow length of the structure shall be 2–feet.

The main body of the outlet structure shall consist of 12–inch D50 class III riprap. The upstream face of the outlet structure shall consist of a 1–foot thick layer of 1–inch D50 washed stone. The maximum sideslope of the rock structure shall be 2:1.

Install a non–woven geotextile filter fabric before installing the stone for the outlet structure. Allow the stone to extend downstream past the toe of the embankment. Geotextile filter fabric shall conform to the specifications.

All inside sediment trap slopes should be 3:1 or flatter.

Mark the sediment cleanout level of trap with a stake in the field. Seed and mulch all disturbed areas.

### Inspection and Maintenance:

The key to a functional sediment trap is continual monitoring, regular maintenance and regular sediment removal.

Remove sediment when it reaches 50% of storage volume or reaches the top of cleanout stake.

Regular inspections should be done every seven (7) calendar days and within 24–hours after each rainfall event that produces ½–inches or more of precipitation.

All temporary sediment traps should be removed within 30 days after final site stabilization is achieved or after it is no longer needed.

Trapped sediment should be removed from, or stabilized on site.

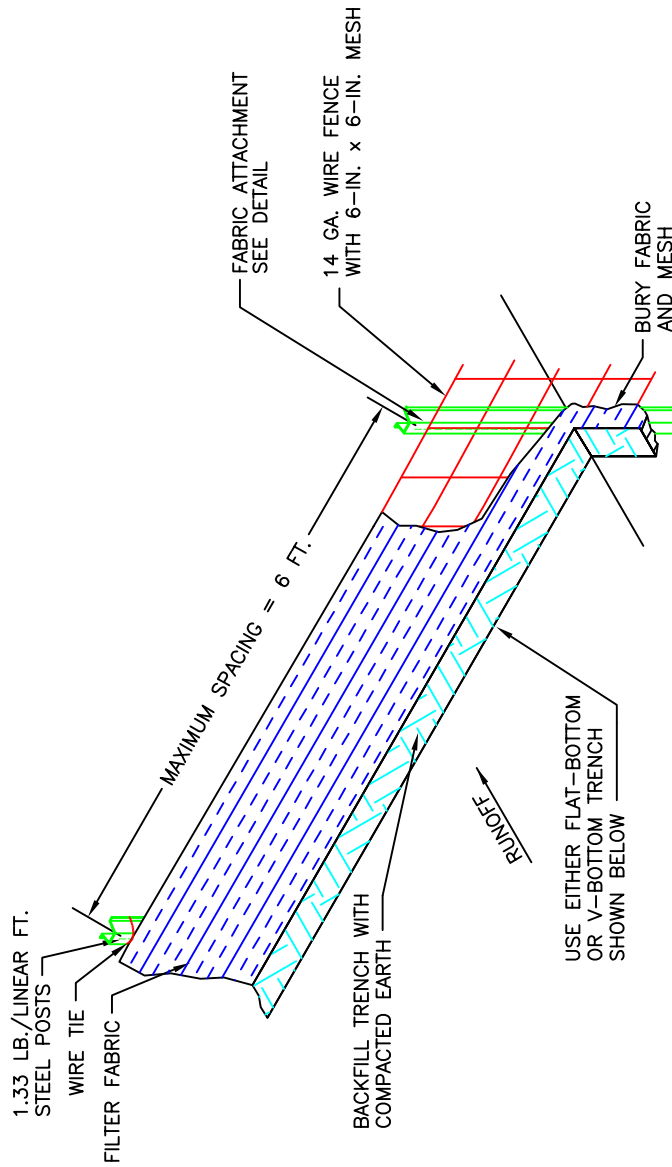
Disturbed areas resulting from the removal of the sediment trap should be permanently stabilized.



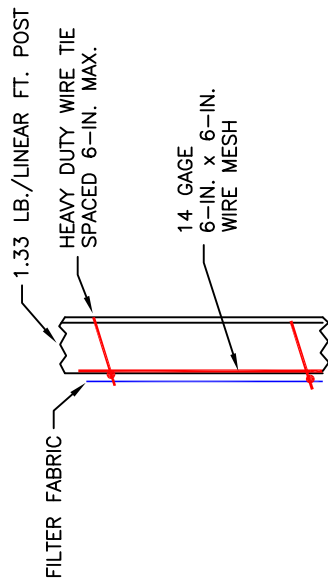
**Fort Jackson**  
**Land Disturbance Handbook**

SEDIMENT TRAP

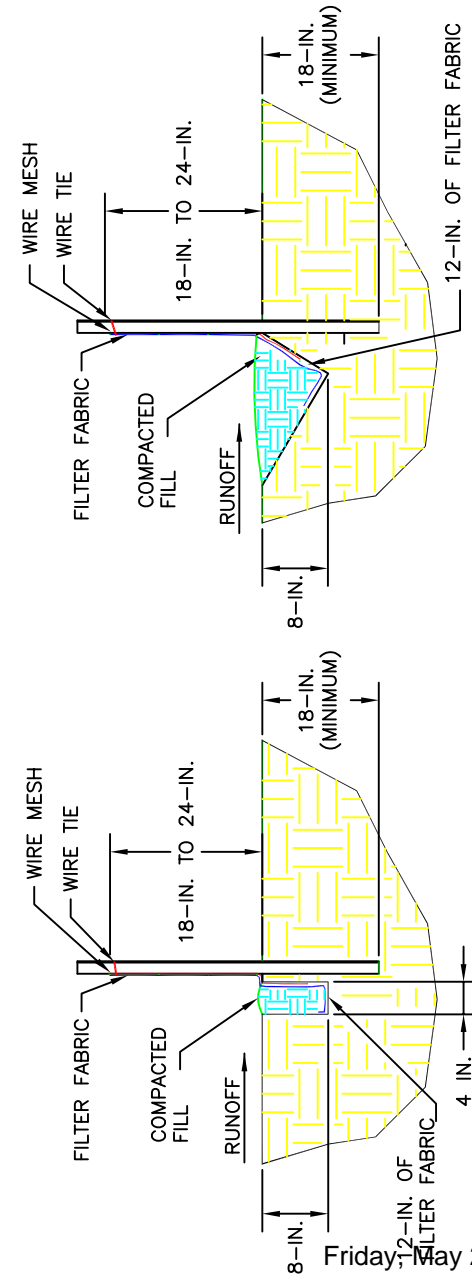
STANDARD DRAWING NO. EC-02 Page 2 of 2



## SILT FENCE INSTALLATION



## FABRIC ATTACHMENT DETAIL



## V-SHAPED TRENCH DETAIL

## FLAT-BOTTOM TRENCH DETAIL



Fort Jackson  
Land Disturbance Handbook

REINFORCED SILT FENCE

STANDARD DRAWING NO. EC-04 Page 1 of 3

## REINFORCED SILT FENCE

### Installation:

The fence should be placed at all fill slopes and soil berms or where the disturbed area that is no more than  $\frac{1}{4}$  acre per 100 feet of fabric. The fence shall run across the slope along a line of uniform elevation (perpendicular to the direction of flow). The fence should be located at least 10-feet from the toe of steep slopes to provide sediment storage and access for maintenance and cleanout.

A flat-bottom trench approximately 4-inches wide and 8-inches deep, or a V-shaped trench 8-inches deep should be excavated.

Place 12-inches of specified filter fabric into the 8-inch deep trench, extending the remaining 4-inches towards the up-slope side of the trench.

Extend the 6-inch by 6-inch 14-gage wire mesh into the trench a minimum depth of 8-inches.

Backfill the trench with soil or gravel and compact. Mechanical compaction should be performed as necessary to ensure proper functioning of the fence and posts.

On the downslope side of the trench, drive the 1.33 lb./linear foot steel posts at least 18-inches into the ground, spacing them no further than 6-feet apart.

Posts should be installed, with 1- to 2-inches of the post protruding above the top of the fabric and no more than 36-inches of the post should protrude above the ground. The minimum fence height (height of filter fabric) above grade shall be 18-inches. The maximum fence height (height of filter fabric) above grade shall be 24-inches.

Filter fabric should be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter fabric should be wrapped together only at a support post with both ends securely fastened to the post, with a minimum 6-inch overlap. Only those filter fabrics that meet the specifications detailed by Fort Jackson shall be used.

Heavy duty wire ties spaced a maximum of 6-inches apart, should be used to attach the fabric and wire mesh to the steel posts.



Fort Jackson  
Land Disturbance Handbook

REINFORCED SILT FENCE

STANDARD DRAWING NO. EC-04 Page 2 of 3

## REINFORCED SILT FENCE

### Inspection and Maintenance:

Inspect silt fence every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Check for areas where runoff has eroded a channel beneath the fence, or where the fence was caused to sag or collapse by runoff overtopping the fence.

If the fence fabric tears, begins to decompose, or in any way becomes ineffective, replace the affected section of fence immediately.

Sediment must be removed when it reaches approximately  $\frac{1}{3}$  the height of the fence, especially if heavy rains are expected.

Reinforced silt fence should be removed within 30 days after final site stabilization is achieved or after temporary BMPs are no longer needed. Trapped sediment should be removed or stabilized on site. Disturbed areas resulting from fence removal shall be permanently stabilized.



Fort Jackson  
Land Disturbance Handbook

REINFORCED SILT FENCE

STANDARD DRAWING NO. EC-04 Page 3 of 3





## ROCK DITCH CHECK

STANDARD DRAWING NO. EC-05 Page 1 of 2

## ROCK DITCH CHECK

### When and Where to Use It

A rock ditch check should be installed in steeply sloped swales, or in swales where adequate vegetation cannot be established. Rock ditch checks should be used only in small open channels. Rock ditch checks should not be placed in waters of the State or US or as designated by USGS topographical blue-line streams.

### Installation:

A non-woven geotextile fabric shall be installed over the soil surface where the rock ditch check is to be placed. The geotextile fabric shall conform to Fort Jackson specifications. The body of the rock ditch check shall be composed of 12-inch D50 Riprap.

The upstream face of the rock ditch check may be composed of 1-inch D50 washed stone.

Rock ditch checks should not exceed a height of 2-feet at the centerline of the channel.

Rock ditch checks should have a minimum top flow length of 2-feet.

Stone should be placed over the channel banks to prevent water from cutting around the ditch check.

The rock must be placed by hand or mechanical placement (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the check is lower than the edges.

The maximum spacing between the dams should be such that the toe of the upstream check is at the same elevation as the top of the downstream check.

### Inspection and Maintenance:

Inspect rock ditch checks every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Inspect for sediment and debris accumulation. Inspect ditch check edges for erosion and repair promptly as required.

Sediment should be removed when it reaches  $\frac{1}{3}$  the original check height.

In the case of grass-lined ditches and swales, rock ditch checks should be removed when the grass has matured sufficiently to protect the ditch or swale unless the slope of the swale is greater than 4%.

After construction is complete, all stone should be removed by the grading contractor if vegetation will be used for permanent erosion control measures.

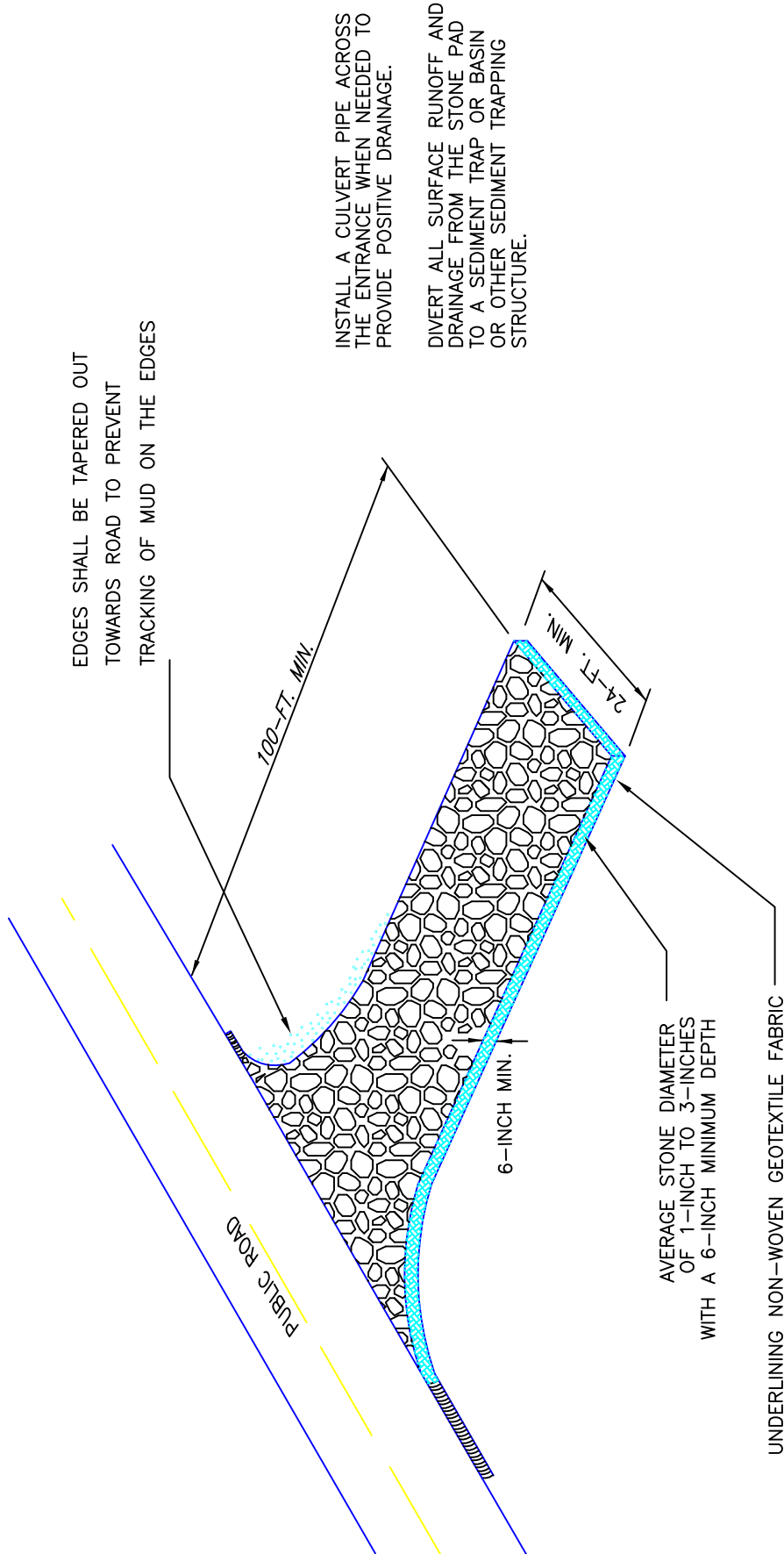
The area beneath the rock ditch checks should be seeded and mulched immediately after rock check dam removal.



**Fort Jackson  
Land Disturbance Handbook**

**ROCK DITCH CHECK**

STANDARD DRAWING NO. EC-05 Page 2 of 2



Fort Jackson  
Land Disturbance Handbook

STABILIZED CONSTRUCTION ENTRANCE

STANDARD DRAWING NO. EC-06 Page 1 of 3

## STABILIZED CONSTRUCTION ENTRANCE

### When and Where to Use It

Stabilized construction entrances should be used at all points where traffic will be leaving a construction site and moving directly onto a public road.

### Important Considerations

If washing is used, provisions must be made to intercept the wash water and trap the sediment before it is carried offsite. Washdown facilities shall be required as directed by Fort Jackson personnel as needed. Washdown areas in general must be established with crushed gravel and drain into a sediment trap or sediment basin. Construction entrances should be used in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by vehicles.

### Installation:

Remove all vegetation and any objectionable material from the foundation area.

Divert all surface runoff and drainage from stones to a sediment trap or basin.

Install a non-woven geotextile fabric prior to placing any stone. The geotextile fabric shall conform to Fort Jackson specifications.

Install a culvert pipe across the entrance when needed to provide positive drainage.

The entrance shall consist of 1-inch to 3-inch D50 stone placed at a minimum depth of 6-inches.

Minimum dimensions of the entrance shall be 24-feet wide by 100-feet long, and may be modified as necessary to accommodate site constraints.

The edges of the entrance shall be tapered out towards the road to prevent tracking of mud at the edge of the entrance.



## STABILIZED CONSTRUCTION ENTRANCE

### Inspection and Maintenance:

Inspect construction entrances every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation, or after heavy use. Check for mud and sediment buildup and pad integrity. Make daily inspections during periods of wet weather. Maintenance is required more frequently in wet weather conditions. Reshape the stone pad as needed for drainage and runoff control.

Wash or replace stones as needed and as directed by the inspector. The stone in the entrance should be washed or replaced whenever the entrance fails to reduce mud being carried off-site by vehicles. Frequent washing will extend the useful life of stone.

Immediately remove mud and sediment tracked or washed onto public roads by brushing or sweeping. Mud and sediment should not swept or brushed into inlets. Flushing should only be used when the water can be discharged to a sediment trap or basin.

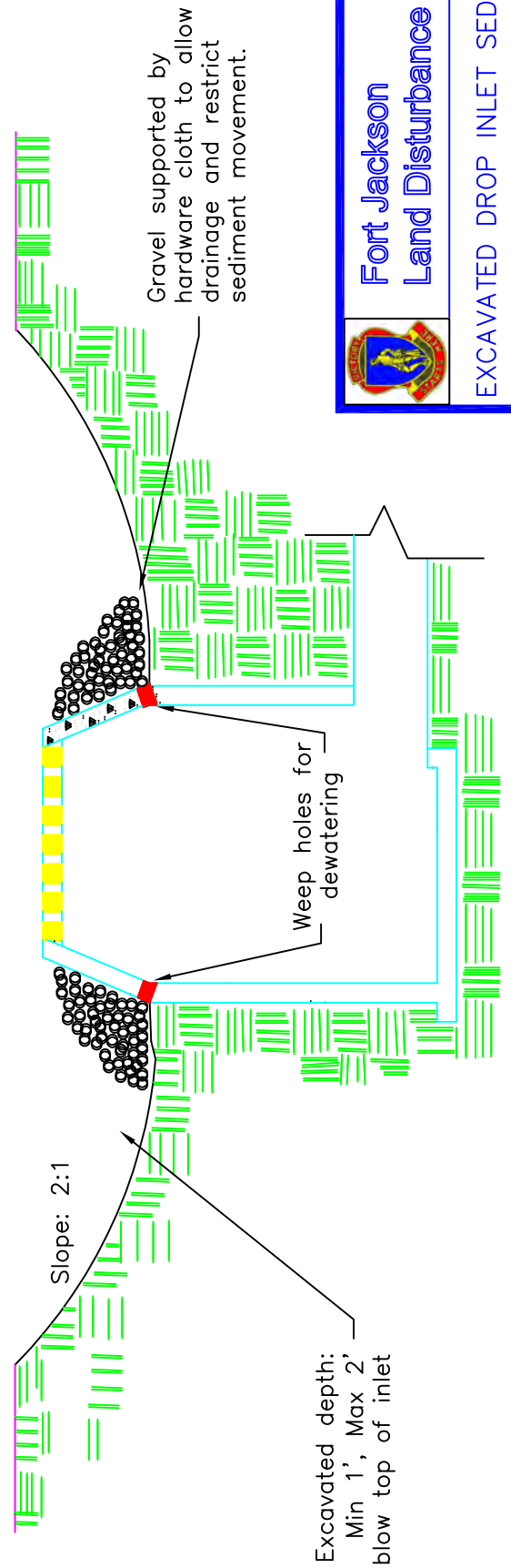
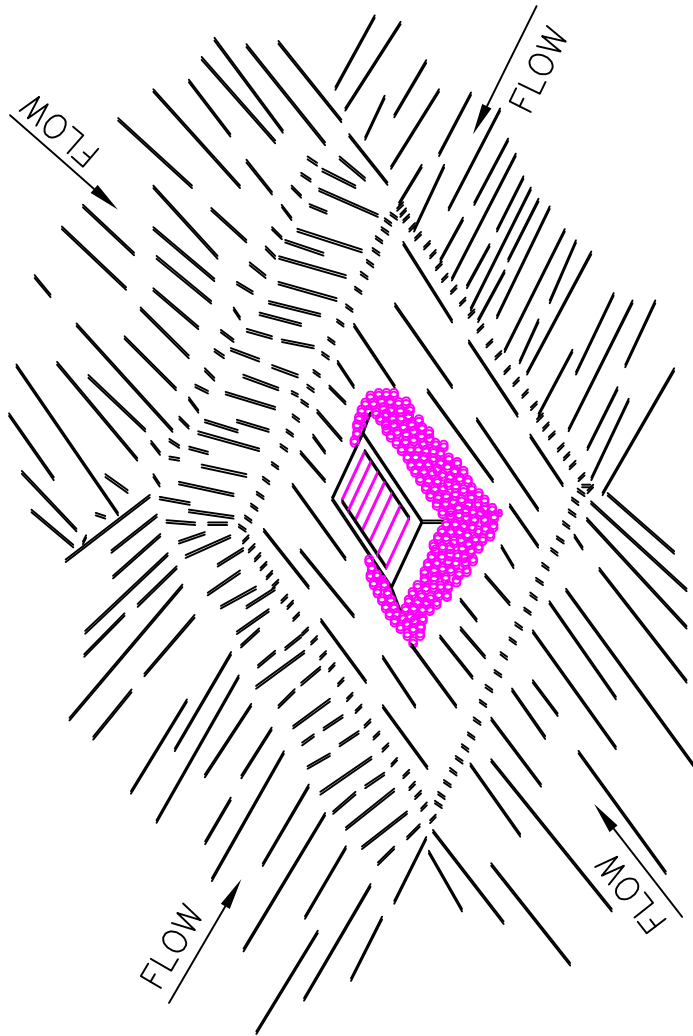
Repair any broken pavement immediately.



## Fort Jackson Land Disturbance Handbook

STABILIZED CONSTRUCTION ENTRANCE

STANDARD DRAWING NO. EC-06 Page 3 of 3



**Fort Jackson  
Land Disturbance Handbook**

**EXCAVATED DROP INLET SEDIMENT TRAP**

STANDARD DRAWING NO. EC-07 Page 1 of 2

## EXCAVATED DROP INLET SEDIMENT TRAP

This type of inlet protection is applicable where heavy flows are expected and where overflow capability and ease of maintenance are desired.

### Installation:

Clear area prior to excavation. Grade area uniformly around the basin.

Excavate as described. Protect weep holes with gravel.

Filter fabric is used for inlet protection when storm water flows are relatively small (0.5 cfs or less) with low velocities and where the inlet drains a relatively flat area (slopes no greater than 5%). This practice cannot be used where inlets are paved or where inlets receive concentrated flows such as in streets or highway medians. The geotextile fabric shall conform to Fort Jackson specifications.

Filter fabric should be purchased in a continuous roll and cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter fabric should be wrapped together only at a support post with both ends securely fastened to the post, with a minimum 6-inch overlap.

The maximum drainage area to this type of inlet is 1 acre.

### Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Any needed repairs should be handled immediately.

Sediment should be removed when it reaches approximately  $\frac{1}{3}$  the depth of the hole. Maintain the pool area, always providing adequate sediment storage volume for the next storm.

Storm drain inlet protection structures should be removed only after the disturbed areas are permanently stabilized. Remove all construction material and sediment, and dispose of them properly. Grade the disturbed area to the elevation of the drop inlet structure crest. Use appropriate permanent stabilization methods to stabilize bare areas around the inlet.

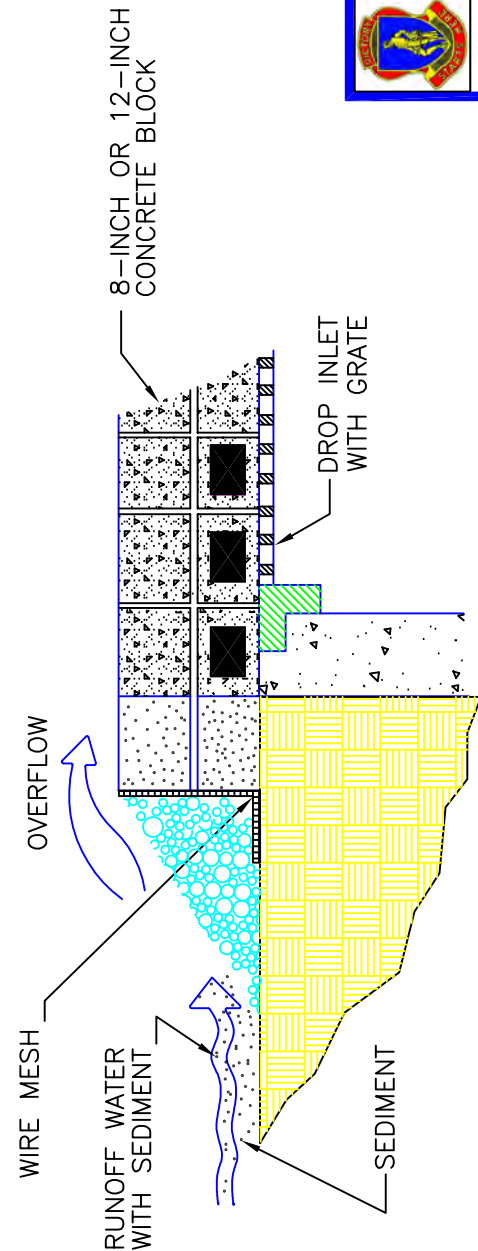
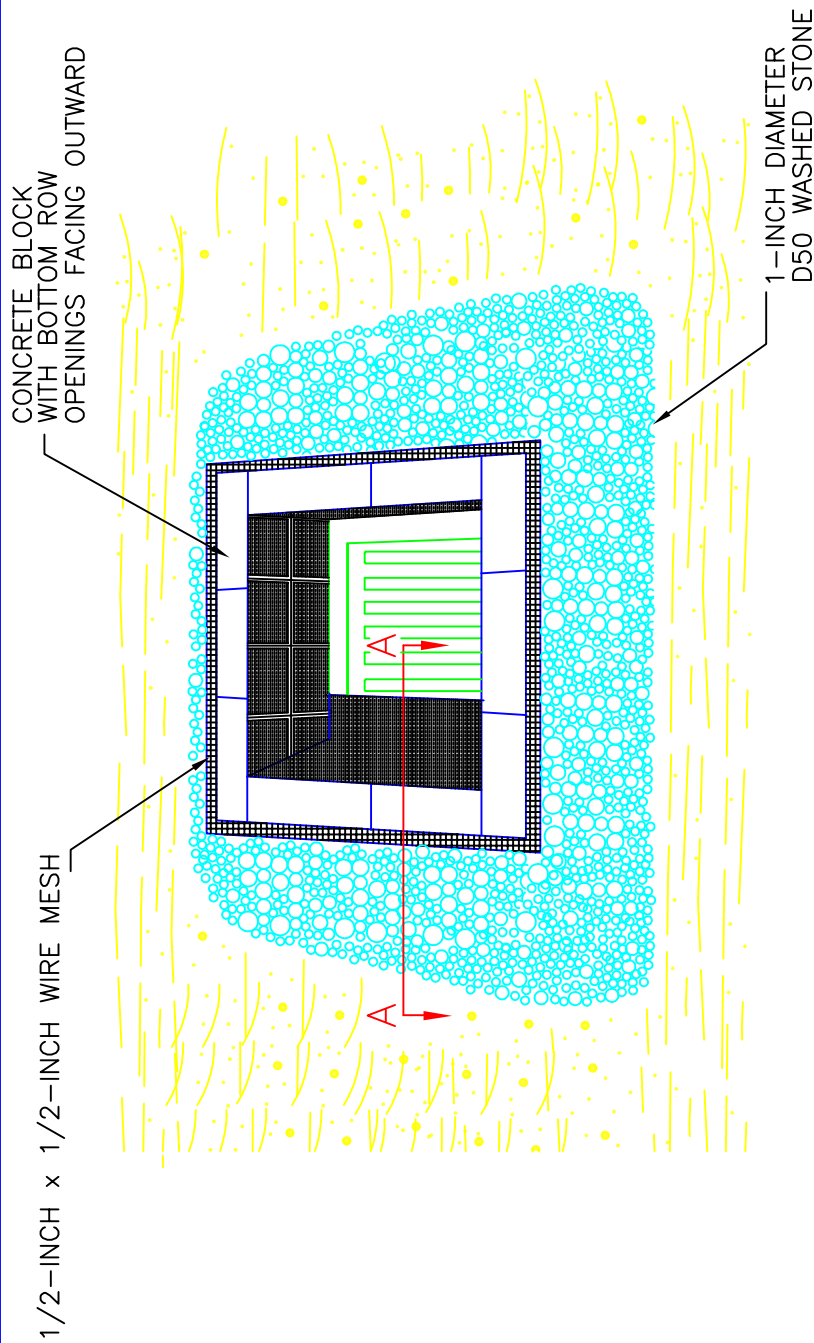


## Fort Jackson Land Disturbance Handbook

FILTER FABRIC INLET PROTECTION

STANDARD DRAWING NO. EC-07 Page 2 of 2





CROSS SECTION A-A



Fort Jackson  
Land Disturbance Handbook

BLOCK AND GRAVEL DROP  
INLET PROTECTION

STANDARD DRAWING NO. EC-08 Page 1 of 2



## BLOCK AND GRAVEL DROP INLET PROTECTION

### Installation:

Block and gravel filters can be used where heavy flows and higher velocities are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure.

Gravel shall consist of 1-inch D50 Washed Stone and should extend to height equal to the elevation of the top of the blocks.

Place the bottom row of the concrete blocks lengthwise on their side so that the open end faces outward, not upward.

The height of the barrier can be varied, depending upon design needs by stacking a combination of blocks that are 8- and 12-inches wide.

Wire mesh should be placed over the outside vertical face of the concrete blocks to prevent stones from being washed through the holes in the blocks. Hardware cloth or comparable wire mesh with  $\frac{1}{2}$ -inch x  $\frac{1}{2}$ -inch openings should be used.

### Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Any needed repairs should be handled immediately.

Sediment should be removed when it reaches approximately  $\frac{1}{3}$  the height of the blocks. If a sump is used, sediment should be removed when it fills approximately  $\frac{1}{3}$  the depth of the hole.

If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.

Storm drain inlet protection structures should be removed only after the disturbed areas are permanently stabilized. Remove all construction material and sediment, and dispose of them properly. Grade the disturbed area to the elevation of the drop inlet structure crest. Stabilize all bare areas immediately.



## Fort Jackson Land Disturbance Handbook

### BLOCK AND GRAVEL DROP INLET PROTECTION

## GRAVEL CURB INLET PROTECTION WITH SEDIMENT FILTER

### Installation:

gravel filters can be used where heavy flows and higher velocities are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure.

Gravel shall consist of SCDOT #4 Stone and should extend to height equal to the elevation of the top of the blocks.

Wire mesh should be placed over the top of the curb inlet. Hardware cloth or comparable wire mesh with  $\frac{1}{2}$ -inch x  $\frac{1}{2}$ -inch openings should be used.

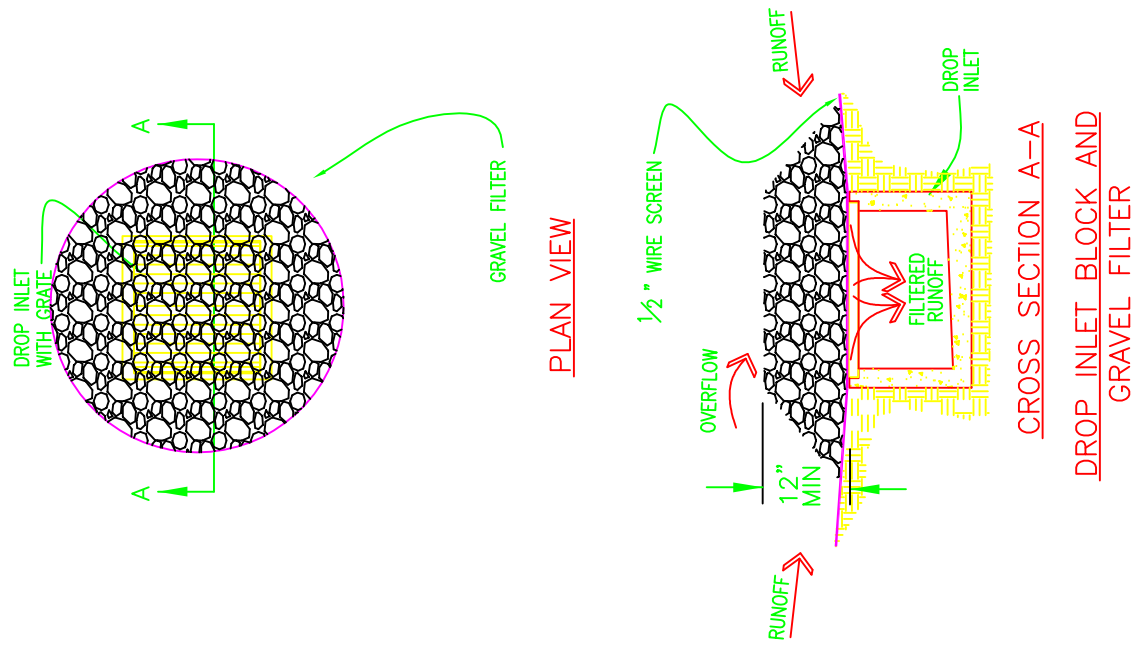
### Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Any needed repairs should be handled immediately.

Sediment should be removed when it reaches approximately  $\frac{1}{3}$  the height of the inlet.

If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.

Storm drain inlet protection structures should be removed only after the disturbed areas are permanently stabilized. Remove all construction material and sediment, and dispose of them properly. Grade the disturbed area to the elevation of the drop inlet structure crest. Stabilize all bare areas immediately.



## Fort Jackson Land Disturbance Handbook

### GRAVEL CURB INLET PROTECTION WITH SEDIMENT FILTER

## BLOCK AND GRAVEL CURB INLET PROTECTION

### Installation:

Block and gravel filters can be used where heavy flows and higher velocities are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure.

Gravel shall consist of SCDOT #4 Stone and should extend to height equal to the elevation of the top of the blocks.

Place the bottom row of the concrete blocks lengthwise on their side so that the open end faces outward, not upward.

The height of the barrier can be varied, depending upon design needs by stacking a combination of blocks that are 8- and 12-inches wide.

Wire mesh should be placed over the outside vertical face of the concrete blocks to prevent stones from being washed through the holes in the blocks. Hardware cloth or comparable wire mesh with  $\frac{1}{2}$ -inch x  $\frac{1}{2}$ -inch openings should be used.

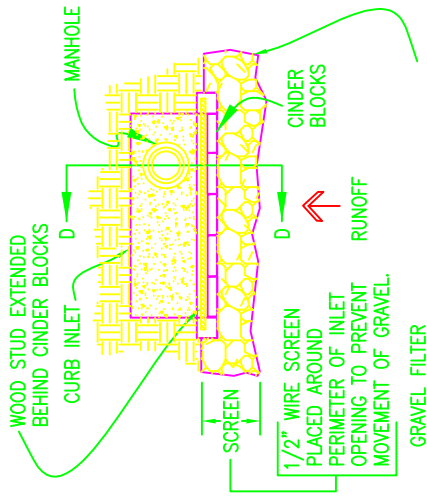
### Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Any needed repairs should be handled immediately.

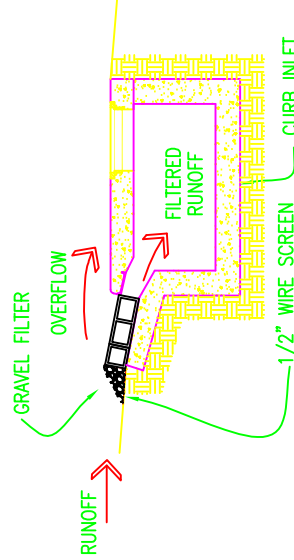
Sediment should be removed when it reaches approximately  $\frac{1}{3}$  the height of the blocks. If a sump is used, sediment should be removed when it fills approximately  $\frac{1}{3}$  the depth of the hole.

If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.

Storm drain inlet protection structures should be removed only after the disturbed areas are permanently stabilized. Remove all construction material and sediment, and dispose of them properly. Grade the disturbed area to the elevation of the storm inlet structure crest. Stabilize all bare areas immediately.



PLAN VIEW



CROSS SECTION D-D

CURB INLET BLOCK AND GRAVEL FILTER

(LOW VOLUME TRAFFIC AREAS ONLY)



**Fort Jackson**  
**Land Disturbance Handbook**

BLOCK AND GRAVEL CURB  
INLET PROTECTION

STANDARD DRAWING NO. EC-10 Page 1 of 1

## GRAVEL CURB INLET PROTECTION WITH SEDIMENT FILTER

### Installation:

gravel filters can be used where heavy flows and higher velocities are expected and where an overflow capacity is necessary to prevent excessive ponding around the structure.

Gravel shall consist of SCDOT #4 Stone and should extend to height equal to the elevation of the top of the blocks.

Wire mesh should be placed over the top of the curb inlet. Hardware cloth or comparable wire mesh with  $\frac{1}{2}$ -inch x  $\frac{1}{2}$ -inch openings should be used.

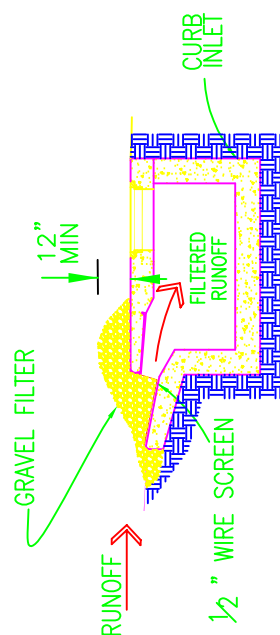
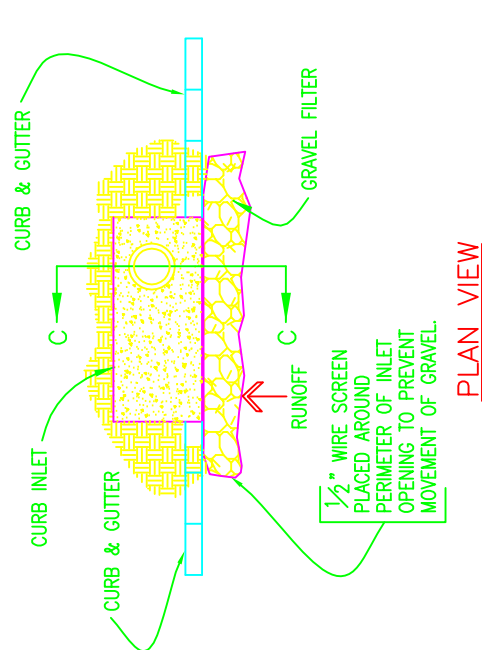
### Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Any needed repairs should be handled immediately.

Sediment should be removed when it reaches approximately  $\frac{1}{3}$  the height of the inlet.

If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.

Storm drain inlet protection structures should be removed only after the disturbed areas are permanently stabilized. Remove all construction material and sediment, and dispose of them properly. Grade the disturbed area to the elevation of the drop inlet structure crest. Stabilize all bare areas immediately.



CROSS SECTION C-C

CURB INLET GRAVEL AND  
WIRE MESH FILTER



**Fort Jackson**  
**Land Disturbance Handbook**

GRAVEL CURB INLET PROTECTION  
WITH SEDIMENT FILTER

STANDARD DRAWING NO. EC-11 Page 1 of 1

# CURB INLET PROTECTION WITH 2"X4" WOODEN WEIR

## Installation:

Wooden frame shall be constructed of 2-inch x 4-inch construction grade lumber.

Filter fabric shall conform to Fort Jackson specifications.

Wire mesh across throat shall be continuous piece of 30-inch minimum width with a length 4 feet longer than throat. It shall be shaped and securely nailed to a 2" x 4" weir.

The assembly shall be securely nailed to 2" x 4" spacers 9-inches long spaced a minimum of 6-feet apart.

The assembly shall be placed against the inlet and secured by 2" x 4" anchors 2-feet long extending across the top of the inlet and held in place by sandbags or alternate weights.

The maximum drainage area is 1-acre.

The stone shall consist of SCDOT #4 Washed Stone, shall extend to a minimum height of 12-inches, and shall not exceed 24-inches.

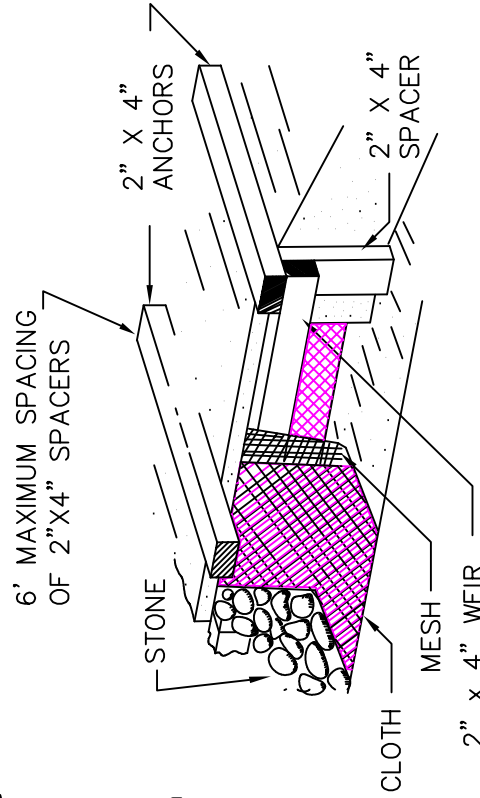
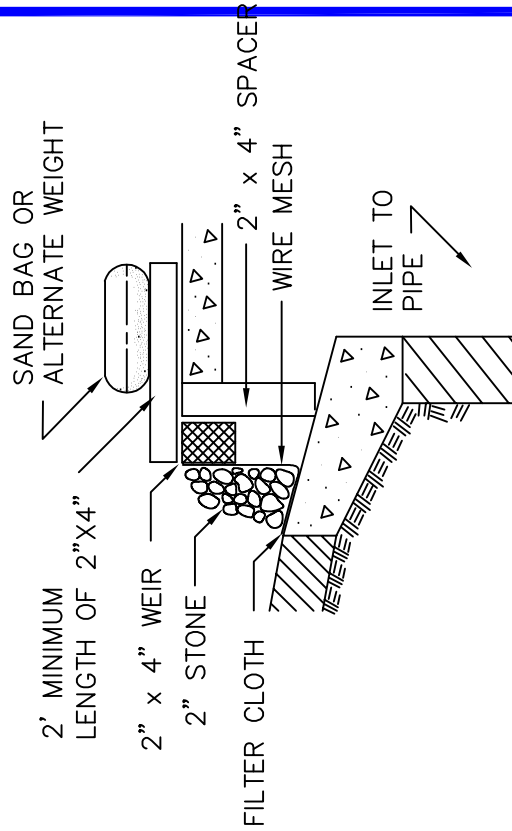
## Inspection and Maintenance:

Inspections should be made every seven (7) calendar days and within 24-hours after each rainfall event that produces 1/2-inches or more of precipitation. Any needed repairs should be handled immediately.

Sediment should be removed when it reaches approximately 1/3 the height of the structure.

If the stone becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced. Since cleaning of gravel at a construction site may be difficult, an alternative approach would be to use the clogged stone as fill and put fresh stone around the inlet.

Storm drain inlet protection structures should be removed only after the disturbed areas are permanently stabilized. Remove all construction material and sediment, and dispose of them properly. Grade the disturbed area to the elevation of the drop inlet structure crest. Stabilize all bare areas immediately.



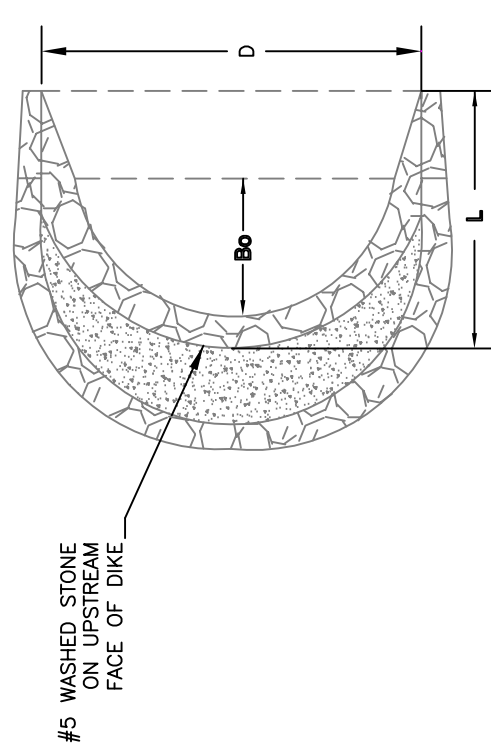
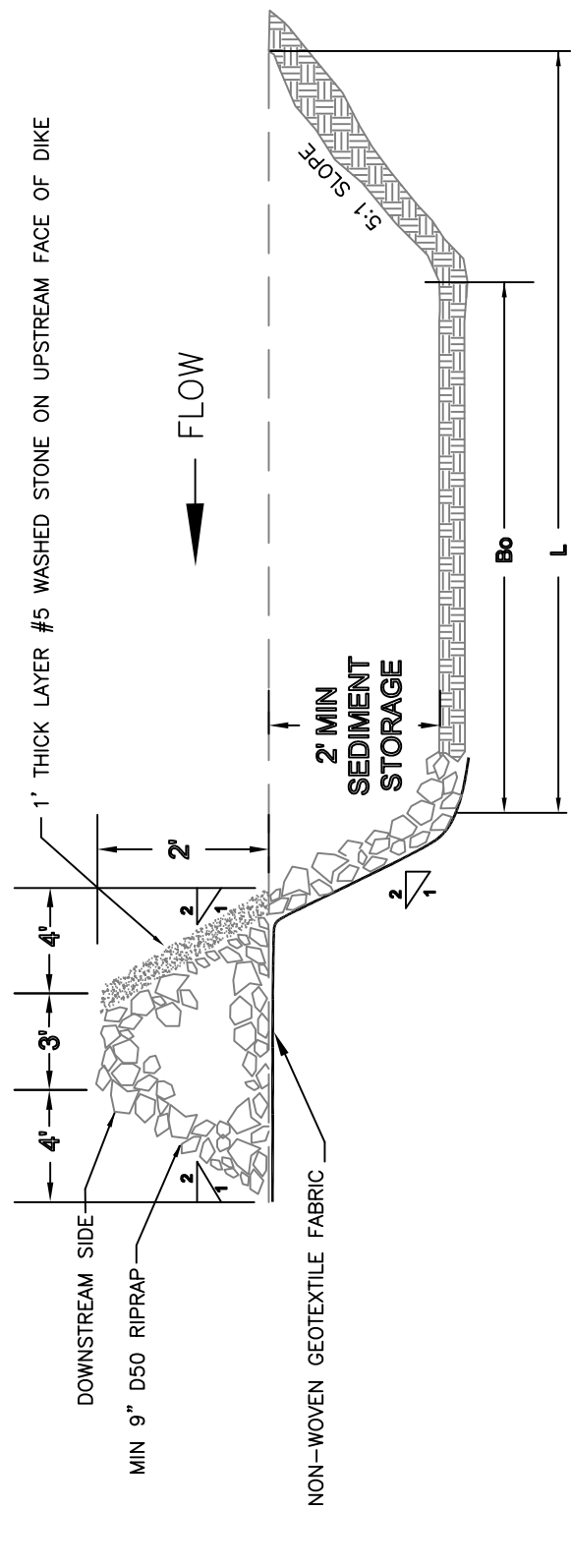
Fort Jackson

Land Disturbance Handbook

CURB INLET PROTECTION WITH WOODEN WEIR

STANDARD DRAWING NO. EC-12 Page 1 of 1

APPROVED BY: FORT JACKSON DLE-ENRD DATE



MAXIMUM 2-ACRE DRAINAGE AREA TO DIKE

TYPICAL ROCK DIKE DIMENSIONS

D	L	Bo	PEAK FLOW (CFS)	TOTAL STORAGE VOL. (CU. FT.)	SEDIMENT STORAGE VOLUME (CU. FT.)
15'	17.5'	3.5'	24.1	838	250
20'	20.0'	6.0'	32.1	1263	406
25'	22.5'	8.5'	40.1	1766	601
30'	25.0'	11.0'	48.2	2348	836



Fort Jackson  
Land Disturbance Handbook

ROCK SEDIMENT DIKE

STANDARD DRAWING NO. EC-13 Page 1 of 3



## ROCK SEDIMENT DIKE

### When and Where to Use It :

Rock sediment dikes are most effective in areas where sediment control is needed with minimal disturbance. They can be used as sediment control structures for the outfalls of diversion swales, diversion dikes, in low areas or other areas where concentrated sediment laden flow is expected. Rock sediment dikes should not be placed in Waters of the State or any other streams that have a base flow.

### Installation:

A non-woven geotextile fabric shall be installed over the soil surface where the rock sediment dike is to be placed. Filter fabric shall conform to Fort Jackson specifications.

The body of the rock sediment dike shall be composed of minimum 9-inch D50 Riprap.

The upstream face of the rock sediment dike shall be composed of a 1-foot thick layer of 3/4-inch to 1-inch D50 washed stone placed at a slope of 2H:1V.

Rock sediment dikes shall have a minimum top flow length of 3-feet (2-foot flow length through the riprap and 1-foot flow length through the washed stone).

The rock must be placed by hand or mechanical placement (no dumping of rock to form the sediment dike) to achieve the proper dimensions.

A sediment sump shall be located on the upstream side of the structure to provide sediment storage. The upstream side of the sediment sump shall have a slope of 5H:1V to inhibit erosion of the sediment storage area. The minimum depth of the sediment sump shall be 2-feet. Mark the sediment cleanup level of the sediment dike with a stake in the field.

Seed and mulch all disturbed areas.



## ROCK SEDIMENT DIKE

### Inspection and Maintenance:

The key to a functional rock sediment dike is continual monitoring, regular maintenance and regular sediment removal.

Regular inspections should be done every seven (7) calendar days and within 24–hours after each rainfall event that produces  $\frac{1}{2}$ –inches or more of precipitation.

Remove sediment when it reaches 50% of the sediment storage volume or when reaches the top of cleanout stake. Removed sediment from the sump should be removed from, or stabilized on site.

All rock sediment dikes should be removed within 30 days after final site stabilization is achieved or after they are no longer needed. Disturbed areas resulting from the removal of rock sediment dikes should be permanently stabilized.

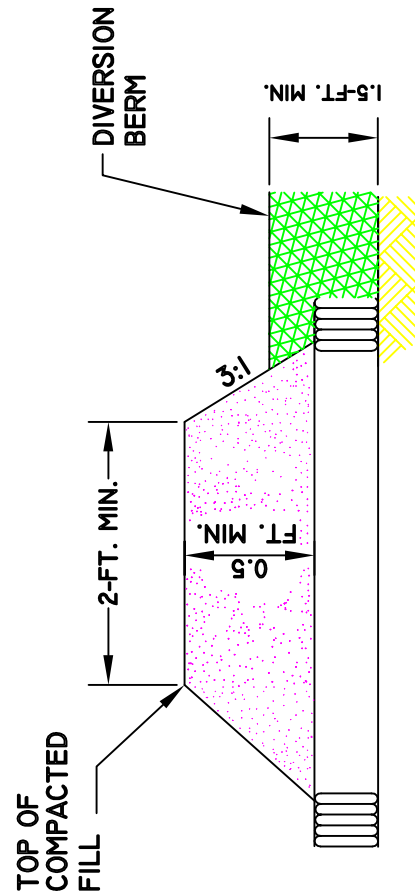
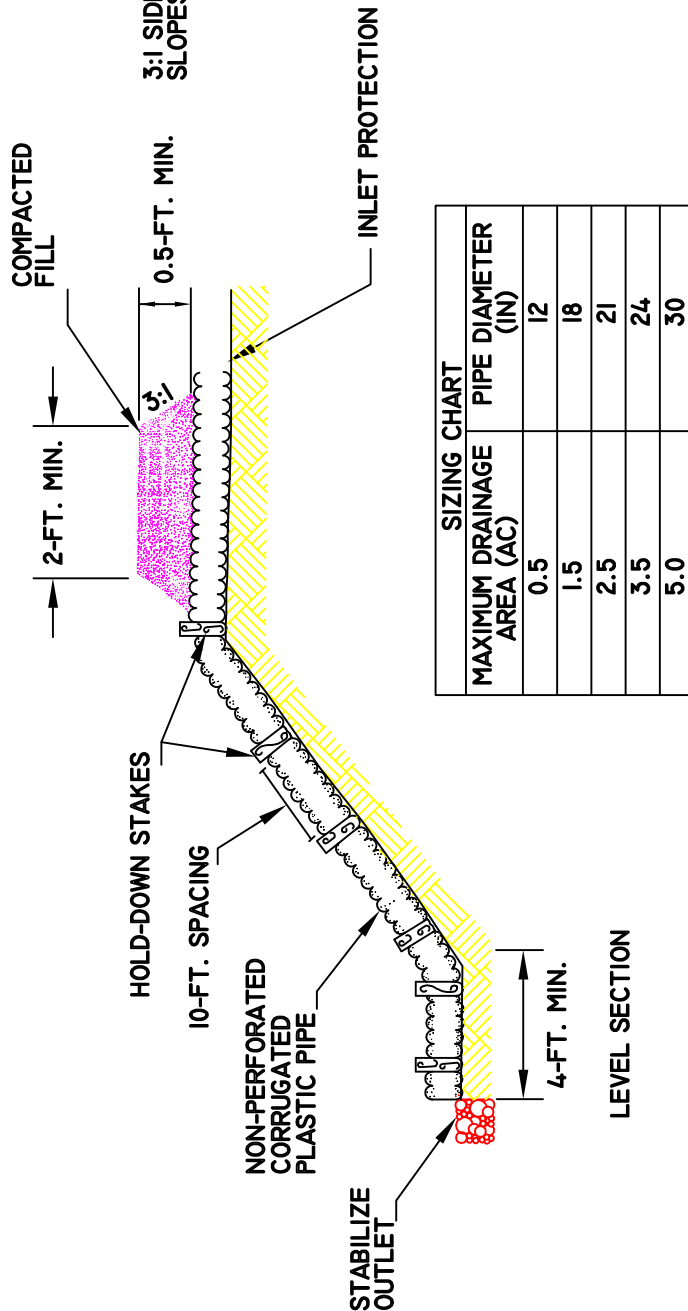
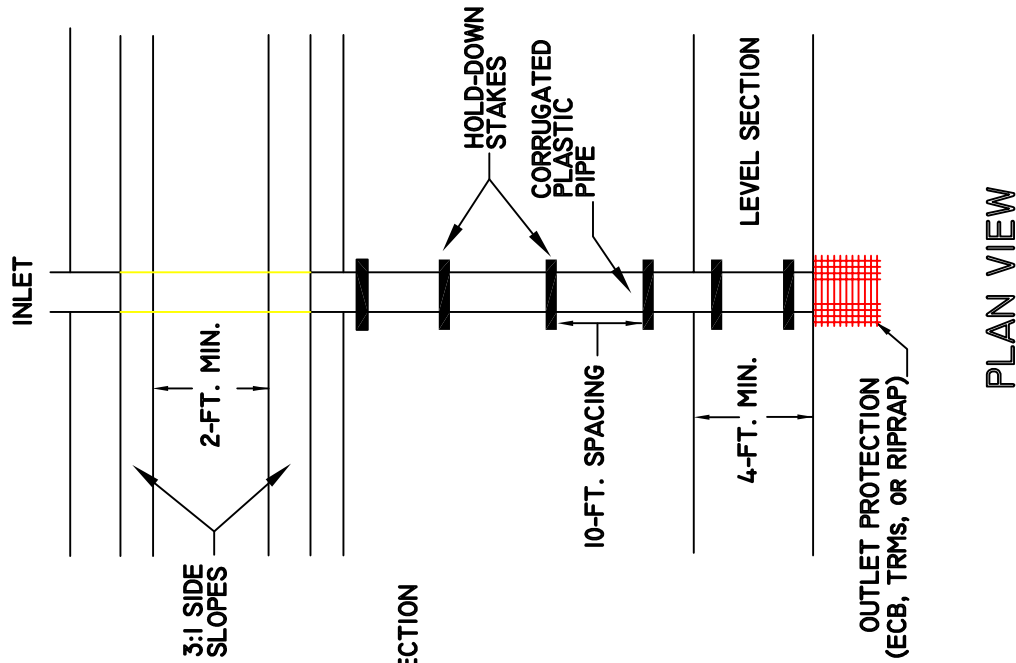


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Land Disturbance Handbook

ROCK SEDIMENT DIKE

STANDARD DRAWING NO. EC-13 Page 3 of 3





## PIPE SLOPE DRAIN

### When and Where to Use It

Pipe slope drains are used when it is necessary for water to flow down a slope without causing erosion, especially before a slope has been stabilized or before permanent drainage structures are installed.

### Installation:

Typical pipe slope drains are made of non-perforated corrugated plastic pipe designed to pass the peak flow rates for the 10-year 24-hour storm event.

Slope drain sections should be securely fastened together, have gasket watertight fittings, and be securely anchored into the soil.

Diversion berms or dikes should direct runoff to slope drains. The minimum depth of these dikes or berms should be 1.5-feet. The height of the berm around the pipe inlet should be a minimum of 1.5-foot high and at least 0.5-foot higher than the top of the pipe. The berm at the pipe inlet shall be compacted around the pipe. The area around the inlet shall be properly stabilized with ECBs, TRMs, riprap or other applicable stabilization techniques.

The area below the outlet must be properly stabilized with ECBs, TRMs, riprap or other applicable stabilization technique.

If the pipe slope drain is conveying sediment-laden water, direct all flows into the sediment trapping facility.

Permanent slope drains should be buried beneath the soil surface a minimum 1.5-feet.

### Inspection and Maintenance:

Inspect pipe slope drain inlet and outlet points every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation.

The inlet should be free from undercutting, and no water should be going around the point of entry. If there are problems, the headwall should be reinforced with compacted earth or sandbags. The outlet point should be free of erosion and installed with appropriate outlet protection.

All temporary pipe slope drains should be removed within 30 days after final site stabilization is achieved or after the temporary BMP is no longer needed. Disturbed soil areas resulting from removal should be permanently stabilized.

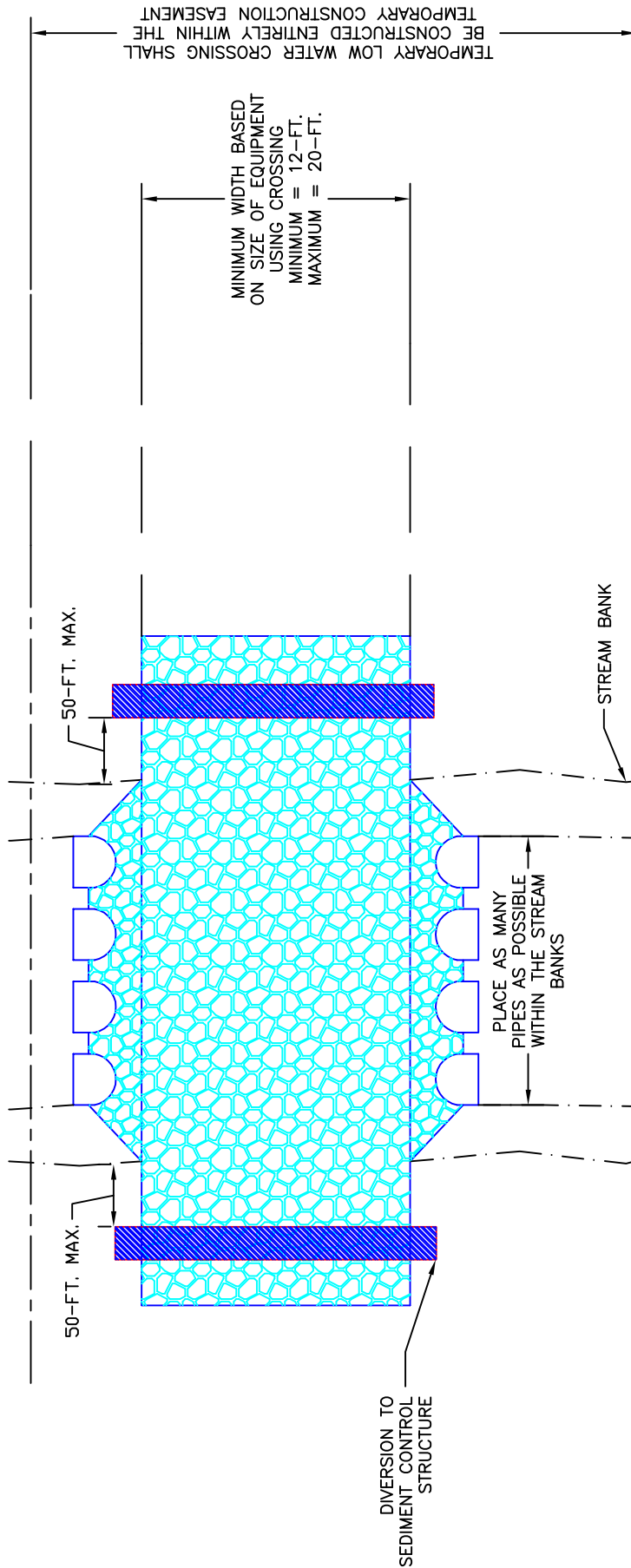




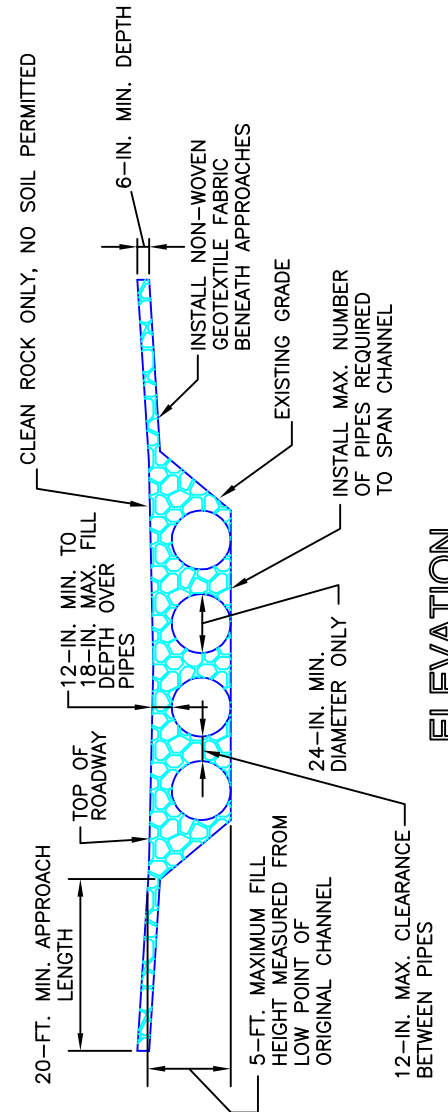
# Fort Jackson Land Disturbance Handbook

TEMPORARY STREAM  
LOW WATER CROSSING

STANDARD DRAWING NO. EC-15 Page 1 of 3



PLAN VIEW



ELEVATION

## TEMPORARY STREAM LOW WATER CROSSING

Prior to constructing a temporary stream crossing, the owner/person financially responsible for the project must submit an Application for Permit to Construct Across or Along a Stream to the South Carolina Department of Health and Environmental Control (SC DHEC). Temporary stream crossings require a Section 404 Permit from the Corps of Engineers. If the crossing creates more than 200 linear feet of fill or more than  $\frac{1}{3}$  acre of fill, a 401 permit may be necessary.

### Installation:

Crossings shall be installed prior to any other activities.

Pump-around diversions shall be installed and maintained prior to any excavation and during the installation of the crossing.

Crossings shall be placed in temporary construction easements only.

The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location. However every effort shall be taken to install the crossing perpendicular to the stream. All fill materials associated with the roadway approach shall be limited to a maximum height of 2-feet above the existing flood plain elevation.

A water diverting structure such as a dike or swale shall be constructed (across the roadway on both roadway approaches) 50-feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50-feet is measured from the top of the waterway bank. The flow captured in these dikes and swales shall be directed to a sediment trapping structure. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

Streambank clearing shall be kept to a minimum. Do not excavate rock bottom streambeds to install the crossing. Lay the culvert pipes on the streambed "as is" when applicable. Place as many pipes as possible within the low area of the stream. Place remaining pipes required to cross the stream on the existing stream bottom.

The maximum number of pipes as possible should be placed within the stream banks with a maximum spacing of 12-inches between pipes. The minimum sized pipe culvert that may be used is 24-inches.

The length of the culvert shall be adequate to extend the full width of the crossing, including side slopes. The slope of the culvert shall be at least 0.25 feet per foot.

Coarse aggregate of clean limestone riprap with a 6-inch D50 stone or greater will be used to form the crossing. The depth of stone cover over the culvert shall be equal to  $\frac{1}{2}$  the diameter of the culvert or 12-inches, whichever is greater but no greater than 18-inches.



**Fort Jackson**  
**Land Disturbance Handbook**

TEMPORARY STREAM  
LOW WATER CROSSING

STANDARD DRAWING NO. EC-15 Page 2 of 3

## TEMPORARY STREAM LOW WATER CROSSING

### Installation:

All fill materials associated with the roadway approach shall be limited to a maximum height of 2–feet above the existing flood plain elevation.

The approaches to the structure shall consist of clean stone or concrete fill only with a minimum thickness of 6–inches. The minimum approach length shall be 20–feet and the width shall be equal to the width of the structure.

### Inspection and Maintenance:

Inspect crossings every seven (7) calendar days and within 24–hours after each rainfall event that produces ½–inches or more of precipitation. Check the structure integrity and for excessive sediment deposition and replace fill stone as needed.

Clean mud and/or sediment from the roadway and do not allow it to enter the stream.

The structure shall be removed when it is no longer required to provide access to the construction area. During removal, leave stone and geotextile fabric for approaches in place. Place fill over the approaches as part of the stream bank restoration operation.

A temporary culvert crossing should be in place no longer than 24–months.



## Fort Jackson Land Disturbance Handbook

TEMPORARY STREAM  
LOW WATER CROSSING

STANDARD DRAWING NO. EC-15 Page 3 of 3

DIKE MATERIAL COMPACTED  
90% STANDARD PROCTOR

2-FT. MIN.

2:1 OR  
FLATTER

1.5-FOOT MIN.

8-FT. MIN.

DIKE SPACING = 100-FT., 200-FT., OR 300-FT. DEPENDING ON GRADE



Fort Jackson  
Land Disturbance Handbook

DIVERSION DIKE OR BERM

STANDARD DRAWING NO. EC-16 Page 1 of 2

Friday, May 27, 2011

## DIVERSION DIKES AND BERMS

### Installation

The top width should be a minimum of 2—feet, and the height should be at least 1.5—feet from the upslope toe.

The side slopes should be 2H:1V or flatter.

Grades should be between 0.5% and 1.0%.

Slopes shall be stabilized immediately using vegetation, sod, and erosion control blankets or turf reinforcement mats to prevent erosion.

The upslope side of the dike should provide positive drainage so no erosion occurs at the outlet. Provide energy dissipation measures as necessary. Sediment—laden runoff must be released through a sediment trapping facility.

Sediment—laden runoff shall be directed to a sediment trapping facility.

Minimize construction traffic over diversion dikes and berms.

### Inspection and Maintenance:

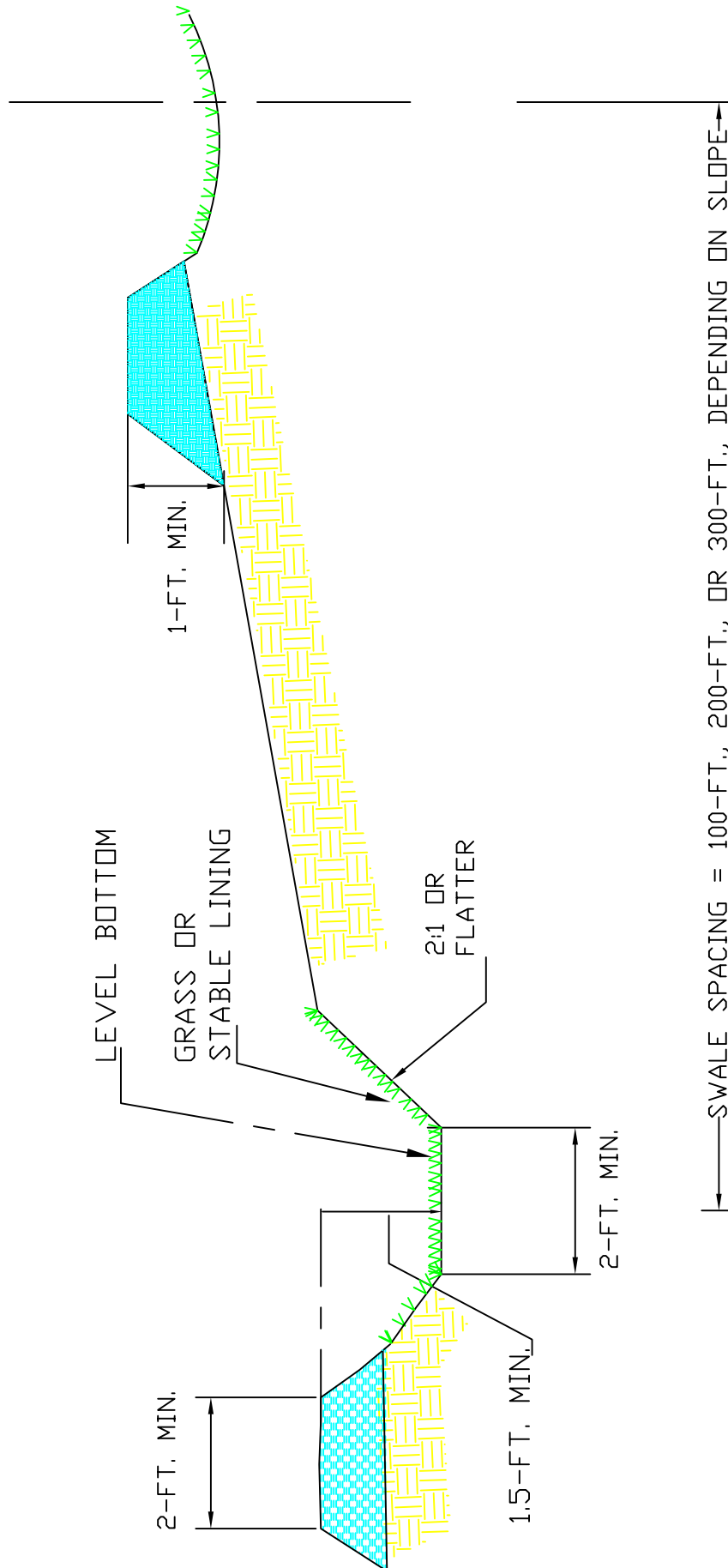
Dikes and Berms should be inspected, every seven (7) calendar days and within 24—hours after each rainfall event that produces ½—inches or more of precipitation and repairs made as necessary.

Damage caused by construction traffic or other activity must be repaired before the end of each working day.



## Fort Jackson Land Disturbance Handbook

### DIVERSION DIKE OR BERM





## DIVERSION SWALE

### Installation

The bottom width should be a minimum of 2—feet, and the bottom should be level.

The depth should be a minimum of 1.5—feet and the side slopes should be 2H:1V or flatter.

The maximum grade shall be 5%, with positive drainage to a suitable outlet.

Slopes shall be stabilized immediately using vegetation, sod, and erosion control blankets or turf reinforcement mats to prevent erosion.

The upslope side of the swale should provide positive drainage so no erosion occurs at the outlet. Provide energy dissipation measures as necessary.

Sediment—laden runoff shall be directed to a sediment trapping facility.

### Inspection and Maintenance:

Swales should be inspected, every seven (7) calendar days and within 24—hours after each rainfall event that produces ½—inches or more of precipitation and repairs made as necessary.

Damage caused by construction traffic or other activity must be repaired before the end of each working day.



## SANDBAG AND SANDBAG BARRIER

### Installation:

Individual sandbags to be filled as shown. End of sandbag are to be folded over to close, not stitched or sown. Sizes shall are standard Army detail.

Sandbags can be filled with sand, gravel, or other non-toxic or degradable sediments.

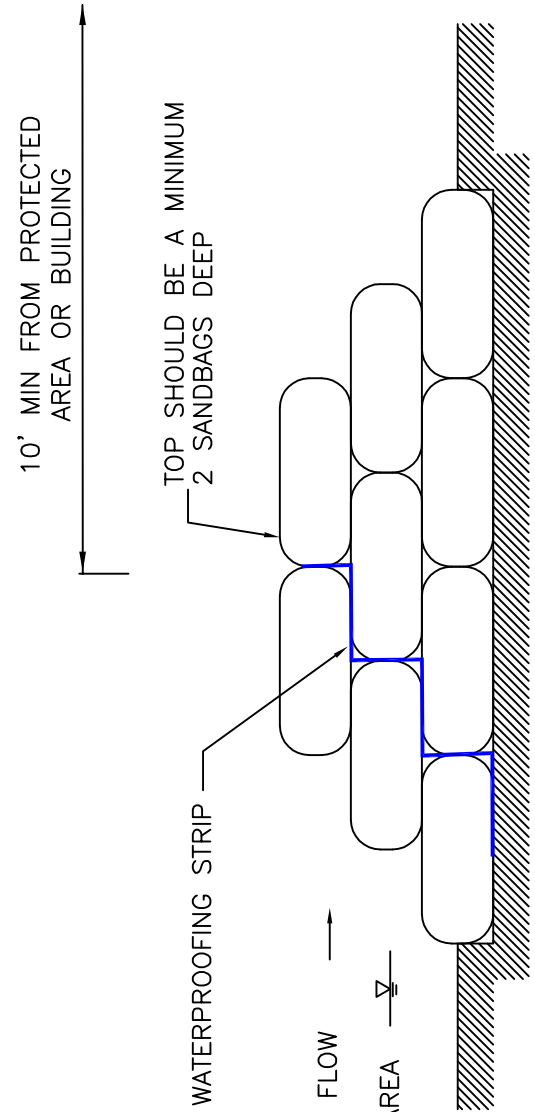
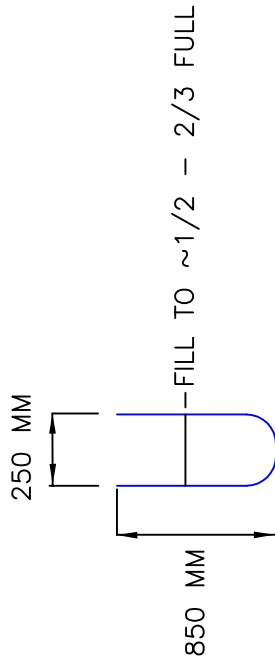
Sandbag material to be a non-woven geotextile fabric which meets Fort Jackson specifications.

Sandbag barrier should have a width to height ratio of 3:1. Barrier should be pyramid shaped with no vertical walls.

Bottom level of barrier should be placed in trench with a depth of 120 – 250 mm.

Ends of sandbags to be butted tightly together within barrier.

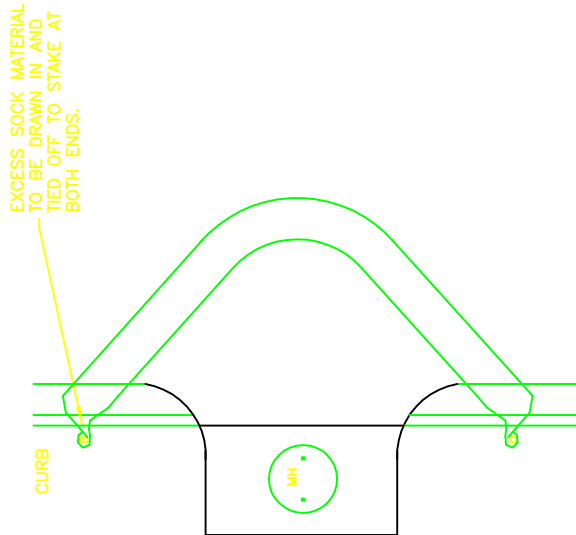
If waterproofing is desired, run water proofing strip through barrier as shown.



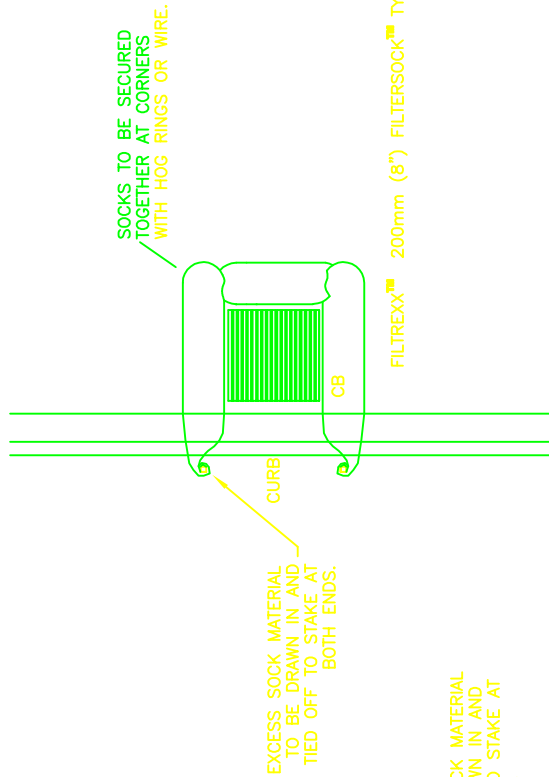
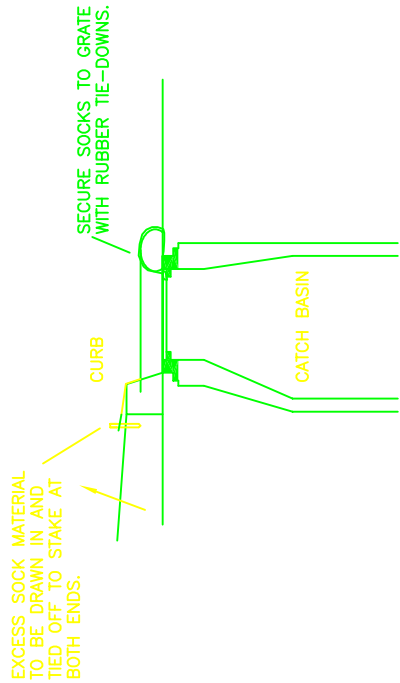
Fort Jackson  
Land Disturbance Handbook

SANDBAG DETAILS

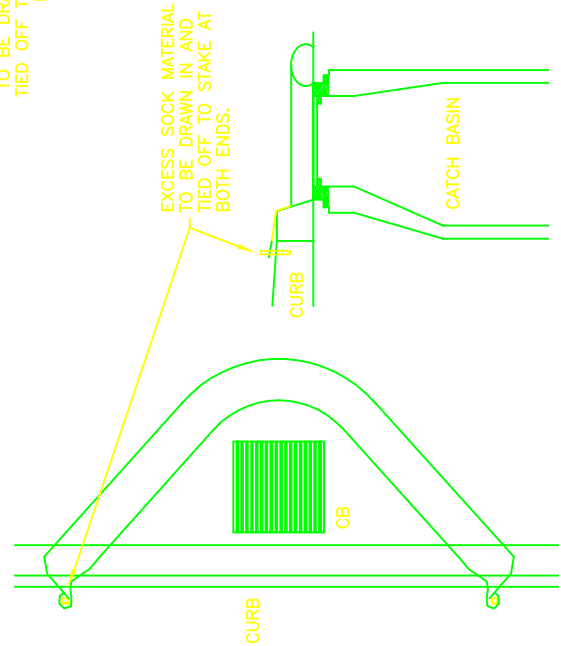
STANDARD DRAWING NO. EC-18 Page 1 of 1



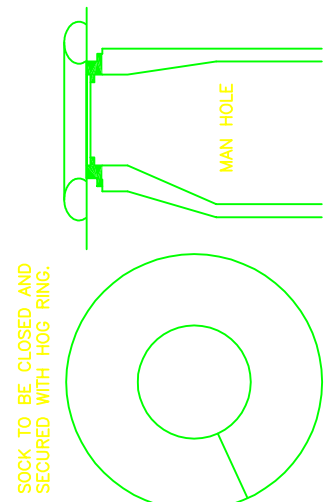
CURB INLET



CATCH BASIN OPTION "B"  
FOR USE IN TIGHTER AREAS, NARROW ROADS ETC.



CATCH BASIN OPTION "A"



MANHOLE



Fort Jackson  
Land Disturbance Handbook

SOCK-TYPE INLET  
PROTECTION

STANDARD DRAWING NO. EC-19 Page 1 of 2

## SOCK INLET PROTECTION

### When and Where to Use It

Use as temporary protection during construction of any curb, grate, or yard inlets, manholes, or catch basins

### Installation:

Socks should be placed around inlet to prevent sediment from entering storm drain system.

Socks are filled with various materials can vary depending on intended use. Engineer should specify this material or sock manufacturer specification should be used.

Sock should be anchored as specified by manufacturer.

If vegetation is to be integrated into sock, it should be filled with manufacturer approved compost material.

### Inspection and Maintenance:

Inspect every seven (7) calendar days and within 24-hours after each rainfall event that produces  $\frac{1}{2}$ -inches or more of precipitation. Inspect for sediment and debris accumulation. Inspect edges for erosion and repair promptly as required.

Sediment should be removed when it reaches  $\frac{1}{3}$  the original sock height.

All protection devices should be removed from site within 30 days after construction activities have ceased.



## Fort Jackson Land Disturbance Handbook

### SOCK-TYPE INLET PROTECTION

SOCK FENCE

When and Where to Use It

Sock fences are considered equivalent to silt fences and can therefore be used any place or situation where silt fences would be used.

Installation:

Sock fences should be placed on level contours to assist in dissipating sheet flow rather than concentrated flow. The end of the fence should pointing upslope.

Sock fences should be placed a minimum of 5 feet from the toe of slopes.

Sock fence should be anchored as specified by manufacturer.

If vegetation is to be integrated into fence, sock should be filled with manufacturer approved compost material.

Inspection and Maintenance:

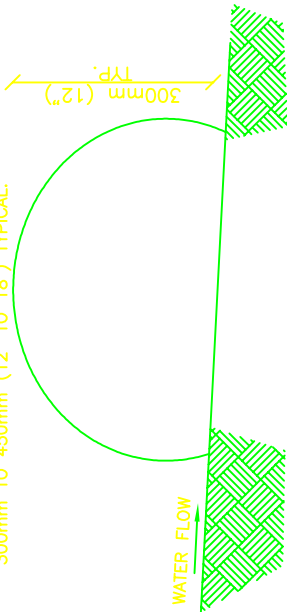
Inspect every seven (7) calendar days and within 24-hours after each rainfall event that produces ½-inches or more of precipitation. Inspect for sediment and debris accumulation. Inspect edges for erosion and repair promptly as required.

Sediment should be removed when it reaches 1/3 the original sock height.

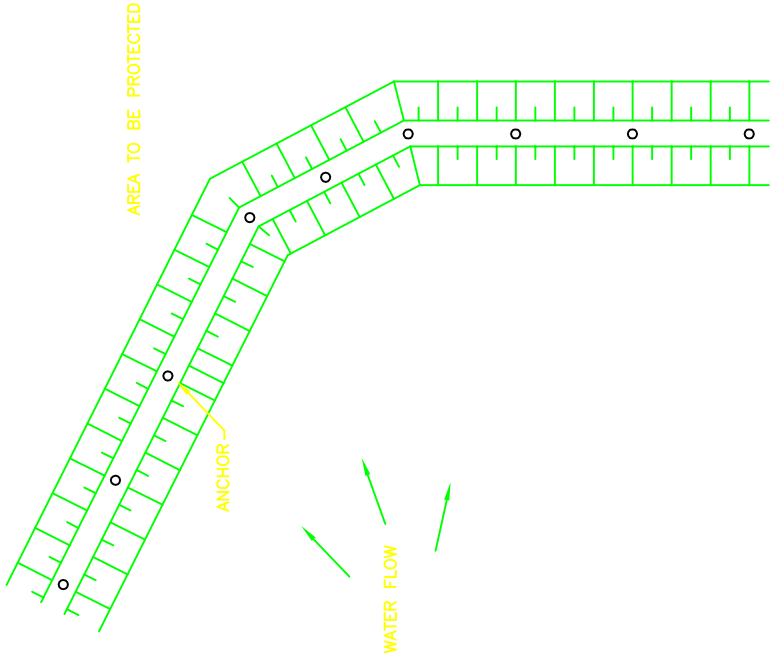
All non-permanent fences should be removed from site within 30 days after construction activities have ceased.

SOCK OPTION:

FILTER SOCK, SIZED TO SUIT CONDITIONS.  
300mm TO 450mm (12" TO 18") TYPICAL.



FILTER COMPOST MATERIAL  
AS PER SPECIFICATIONS.



## GEOTEXTILE FILTER FABRIC

When and Where to Use It

Geotextile fabric should be used as specified in details or as directed by the Engineer or Fort Jackson personnel.

Strength Specifications:Piping Resistance (Soil Retention) & Permittivity Requirements:

	Class 1 <sup>1</sup>		Class 2		Type	AOS (ASTM D 4751)	Permittivity (ASTM D 4491)
	<u>Fabric Protected</u>		<u>Fabric Unprotected</u>				
Grab Strength ASTM D 4632	90 lbs.		200 lbs.		Type A	=No. 30 Std Sieve	=0.7 sec-1
Seam Strength <sup>2</sup> ASTM D 4632	80 lbs.		180 lbs.		Type B	=No. 40 Std Sieve	=0.2 sec-1
Puncture Strength ASTM D 4833	40 lbs.		80 lbs.		Type C	=No. 60 Std Sieve	=0.1 sec-1
Burst Strength ASTM D 3786	140 psi.		250 psi.		Type D	AOS and fabric permittivity requirements will be based on site specific design and will be indicated in the special provisions of the proposal.	
Trapezoid Tear Strength ASTM D 4533	40 lbs.		80 lbs.		Type A fabric will generally be specified for soils with less than 15% particles by weight passing the No. 200 sieve.		
Elongation at Failure ASTM D 4632	15% minimum		15% minimum		Type B fabric will generally be specified for soils with 15% to 50% particles by weight passing the No. 200 sieve.		
Ultraviolet Degradation at 500 Hours ASTM D 4355	50% Strength Retained		50% Strength Retained		Type C fabric will generally be specified for soils with more than 50% particles by weight passing the No. 200 sieve.		
					Type D fabric will generally be specified for Critical/Severe Applications		

<sup>1</sup> Fabric is said to be protected when cushioned from rock placement by a sufficient layer of sand or gravel at least 6 inches thick or by zero height placement. All other conditions are said to be unprotected.

<sup>2</sup> Values apply to both field and manufactured seams. Seams should be sewn upwards for inspection.



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**GEOTEXTILE FILTER FABRIC**

STANDARD DRAWING NO. EC-21 Page 1 of 1

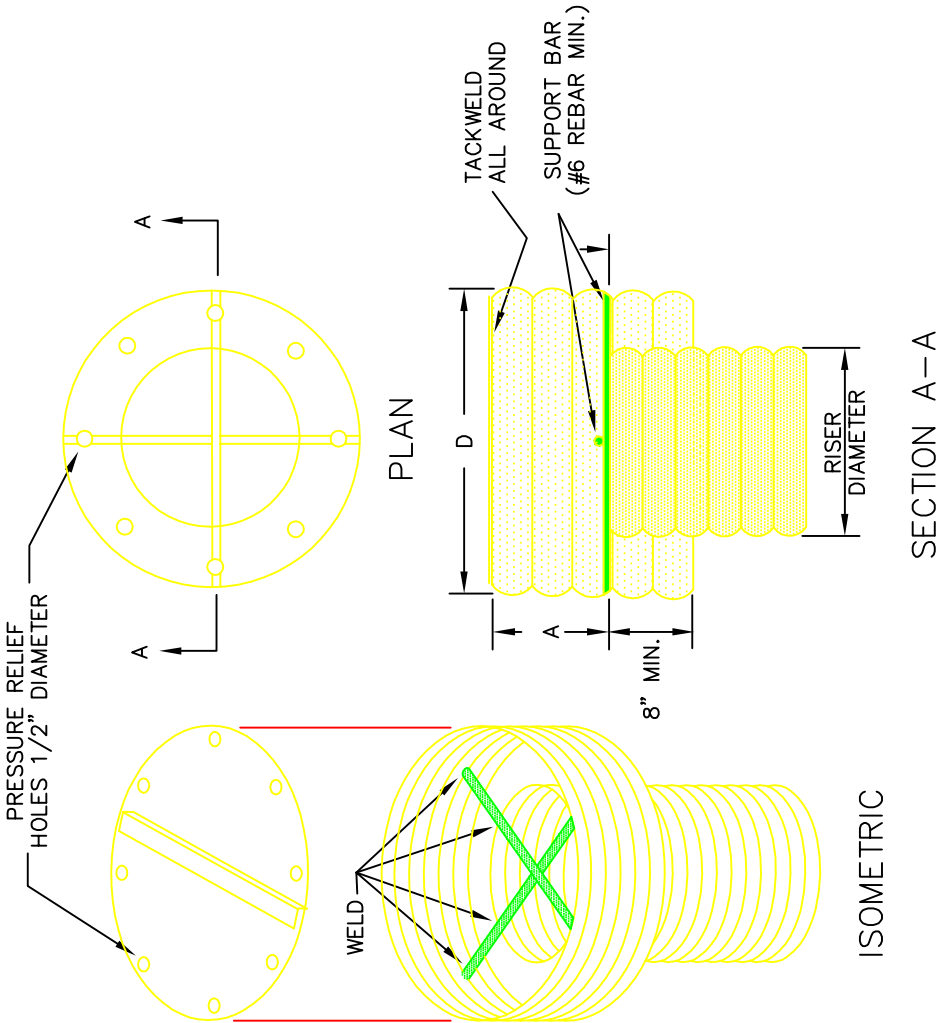
TOP STIFFENER (IF REQUIRED)  
1S \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_  
ANGLE WELDED TO TOP AND  
ORIENTED PERPENDICULAR TO  
CORRUGATIONS.

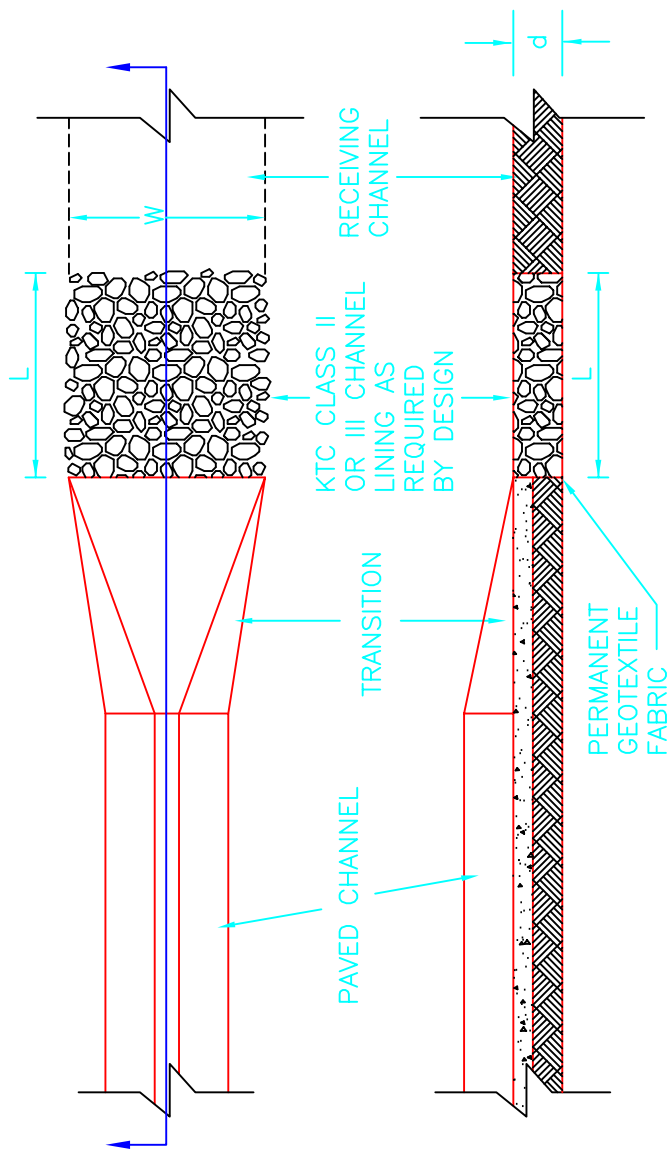
TOP IS \_\_\_\_\_ GAGE CORRUGATED  
METAL OR 1/8" STEEL PLATE.  
PRESSURE RELIEF HOLES MAY BE  
OMITTED, IF ENDS OF COR-  
RUGATIONS ARE LEFT FULLY  
OPENED WHEN THE TOP IS  
ATTACHED.

CYLINDER IS \_\_\_\_\_ GAGE COR-  
RUGATED METAL PIPE OR  
FABRICATED FROM 1/8" STEEL  
PLATE.

NOTES:

- 1. THE CYLINDER MUST BE  
FIRMLY FASTENED TO THE TOP  
OF THE RISER.
- 2. SUPPORT BARS ARE WELDED  
TO THE TOP OF THE RISER  
OR ATTACHED BY STRAPS  
BOLTED TO TOP OF RISER.





NOTES:

1. RIPRAP APRON REDUCES THE FLOW VELOCITY BELOW THE PERMISSIBLE VELOCITY OF THE NATURAL RECEIVING CHANNEL.

2. TRANSITION SIDE DIVERGENCE IS 1 IN 3F, WHERE

$$F = \text{FROUDE NUMBER} = \frac{V}{\sqrt{gd}}, \text{ WHERE}$$

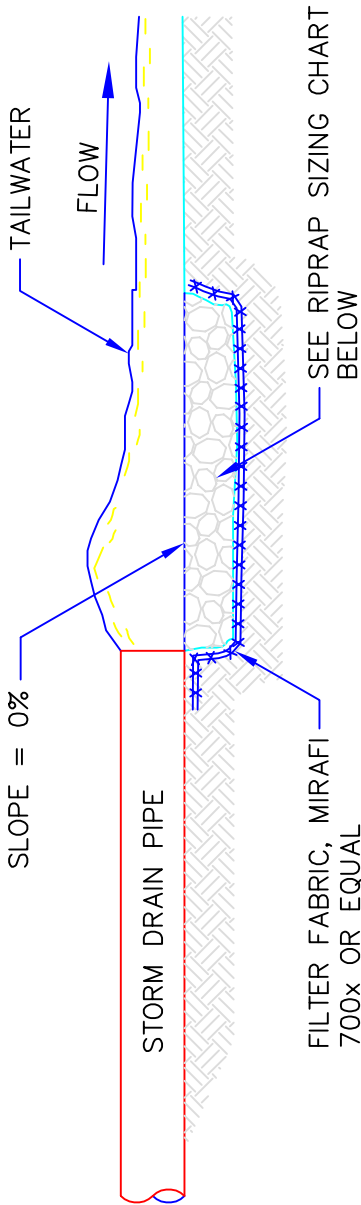
V = VELOCITY AT THE BEGINNING OF THE TRANSITION

d = DEPTH OF FLOW AT THE BEGINNING OF THE TRANSITION

g = 32.2 ft./sec.<sup>2</sup>

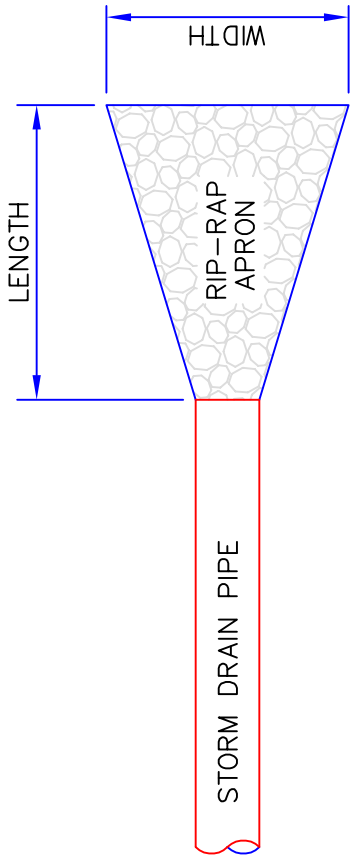






SECTION

RIP-RAP SIZING	
PIPE DIA. (IN.)	D50 (IN.)
12	6
15	6
18	6
24	9
30	9
36	9
42	12
48	12



PLAN

RIP-RAP SCHEDULE		
PIPE DIA. (IN.)	LENGTH (FT.)	WIDTH (FT.)

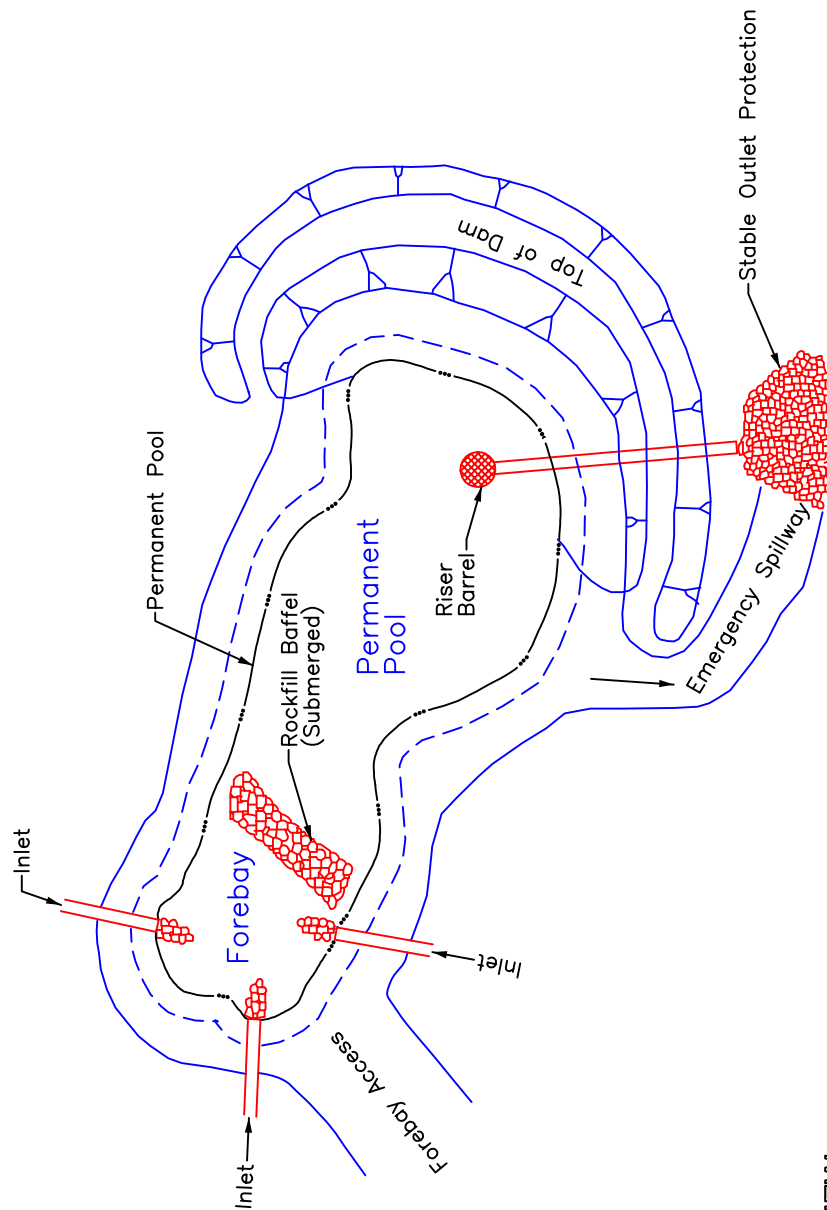
(TO BE COMPLETED BEFORE SUBMITTAL)

RIP-RAP APRON  
NOT TO SCALE

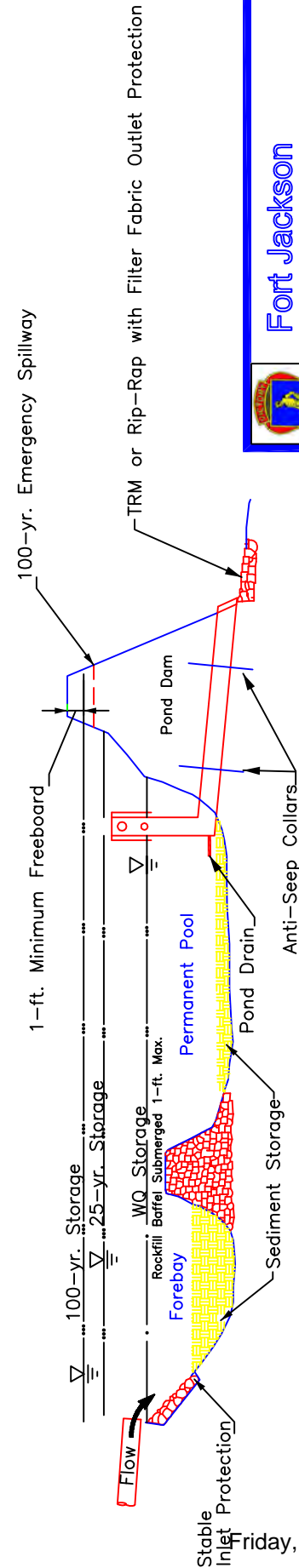


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Land Disturbance Handbook

PIPE/CHANNEL OUTLET



PLAN VIEW



PROFILE



Fort Jackson  
Land Disturbance Handbook

WET DETENTION POND

STANDARD DRAWING NO. WQ-01 Page 1 of 2

## WET DETENTION POND

Wet ponds have a permanent (dead storage) pool of water equal to the water quality volume. Temporary storage (live storage) may be added above the permanent pool elevation for larger flows.

### Installation:

A forebay shall be provided for all inlets to a wet water quality pond and shall be placed upstream of the main wet pond area. The forebay is separated from the larger wet detention pond area by barriers or baffles that may be constructed of earth, stones, riprap, gabions, or geotextiles. The top of the forebay barrier shall be a maximum of one (1)-foot below the normal pool elevation, and may extend above the elevation of the permanent pool.

The permanent pool shall be four (4) to six (6) feet in depth.

A low flow orifice shall be installed to slowly release the water quality volume. The low flow orifice shall be protected from clogging by designing appropriate trash guards. Acceptable trash guards include:

Hoods that extend at least 6-inches below the permanent pool water surface elevation.

Reverse flow pipes where the outlet structure inlet is located at least 6-inches below the permanent pool water surface elevation.

Trash boxes made of sturdy wire mesh.

Emergency spillways shall be installed to safely pass the post-development 100-year 24-hour storm event without overtopping any dam structures.

### Inspection and Maintenance:

The side slopes of the pond shall be mowed monthly.

Since decomposing vegetation captured in the wetpond can release pollutants, especially nutrients, it may be necessary to harvest dead vegetation annually. Otherwise the decaying vegetation can export pollutants out of the pond and also can cause nuisance conditions to occur.

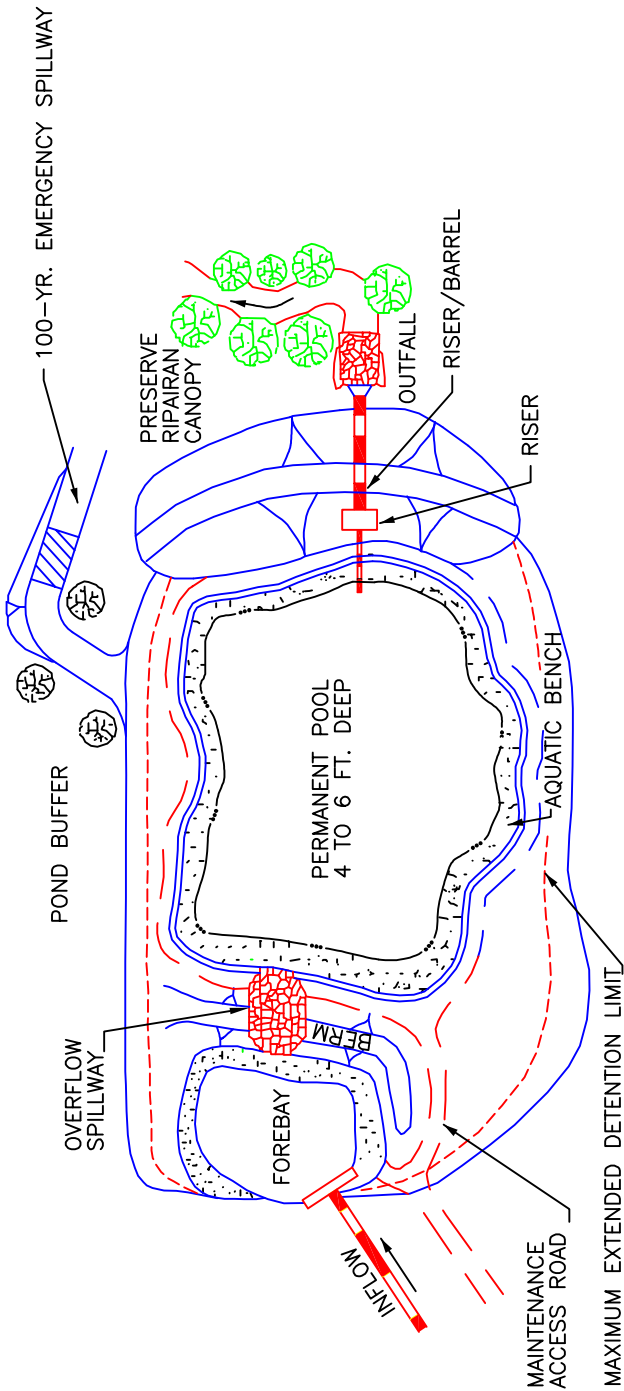
Debris shall be cleared from all inlet and outlet structures monthly.

All eroded or undercut areas shall be repaired as needed.

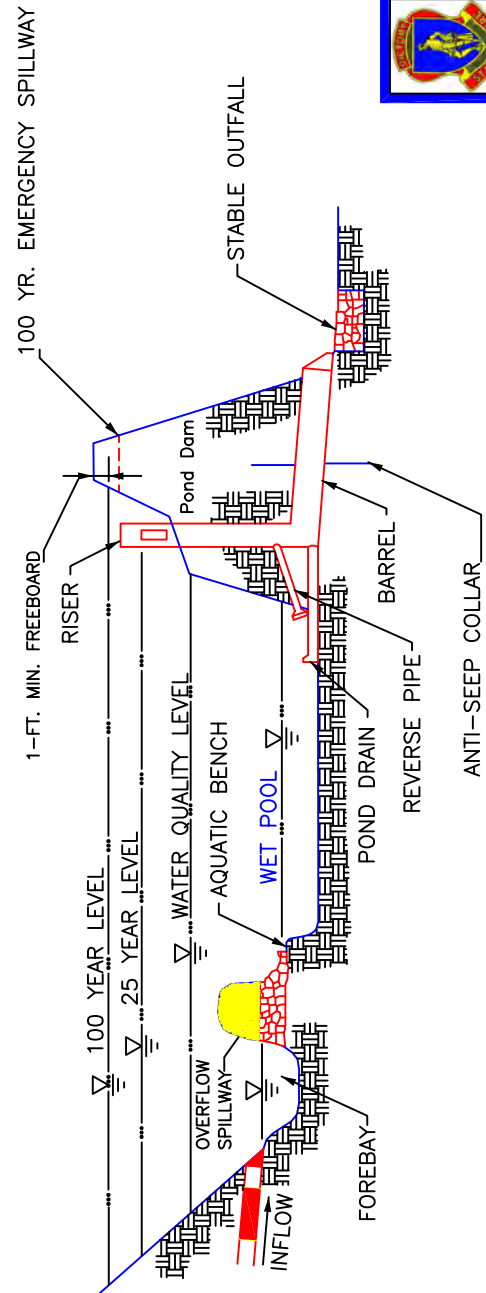
A sediment marker shall be placed in the forebay to determine when sediment removal is required.

Sediment accumulations in the main pond area shall be monitored and sediment shall be removed when the permanent pool volume has been significantly filled and/or the pond becomes eutrophic.





PLAN VIEW



PROFILE



Fort Jackson  
Land Disturbance Handbook

WET EXTENDED DETENTION POND

STANDARD DRAWING NO. WQ-02 Page 1 of 2

## WET EXTENDED DETENTION POND

A wet extended pond is a wet pond where the water quality volume is split evenly between the permanent pool and extended detention storage provided above the permanent pool. During storm events, water is stored above permanent pool and released over 24–hours. The design has similar pollutant removal efficiencies as traditional wet ponds, but consumes less space.

### Installation:

A forebay shall be provided for all inlets to a wet extended water quality pond and shall be placed upstream of the main wet pond area. The forebay is separated from the larger wet detention pond area by a berm that may be constructed of earth, stones, riprap, gabions, or geotextiles. The top of the forebay barrier shall be equal to the normal pool elevation, and may extend above the elevation of the permanent pool. A spillway shall be constructed to convey flow from the forebay to the wet detention pond area.

The permanent pool shall be four (4) to six (6) feet in depth.

A low flow orifice shall be installed to slowly release the water quality volume. The low flow orifice shall be protected from clogging by designing appropriate trash guards. Acceptable trash guards include:

Hoods that extend at least 6–inches below the permanent pool water surface elevation.

Reverse flow pipes where the outlet structure inlet is located at least 6–inches below the permanent pool water surface elevation.

Trash boxes made of sturdy wire mesh.

Emergency spillways shall be installed to pass the post–development 100–year 24–hour storm event without overtopping any structures.

### Inspection and Maintenance:

The side slopes of the pond shall be mowed monthly.

Since decomposing vegetation captured in the wetpond can release pollutants, especially nutrients, it may be necessary to harvest dead vegetation annually. Otherwise the decaying vegetation can export pollutants out of the pond and also can cause nuisance conditions to occur.

Debris shall be cleared from all inlet and outlet structures monthly.

All eroded or undercut areas shall be repaired as needed.

For sediment marker shall be placed in the forebay to determine when sediment removal is required.

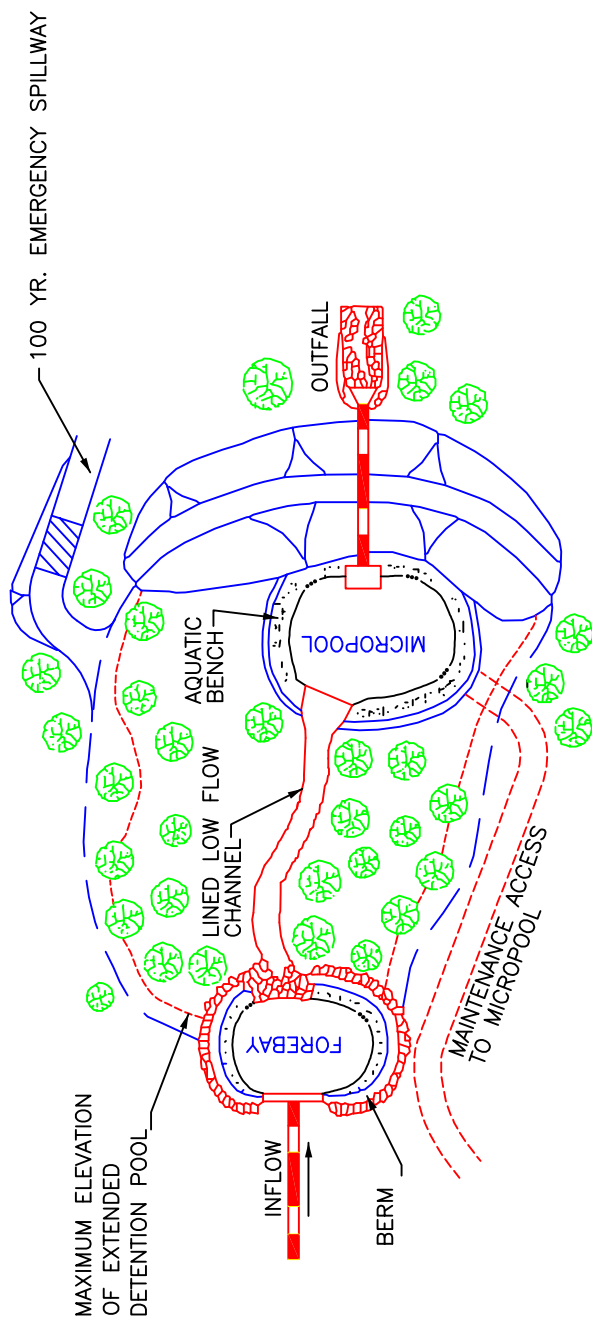
For sediment accumulations in the main pond area shall be monitored and sediment shall be removed when the permanent pool volume has been significantly filled and/or the pond becomes eutrophic.



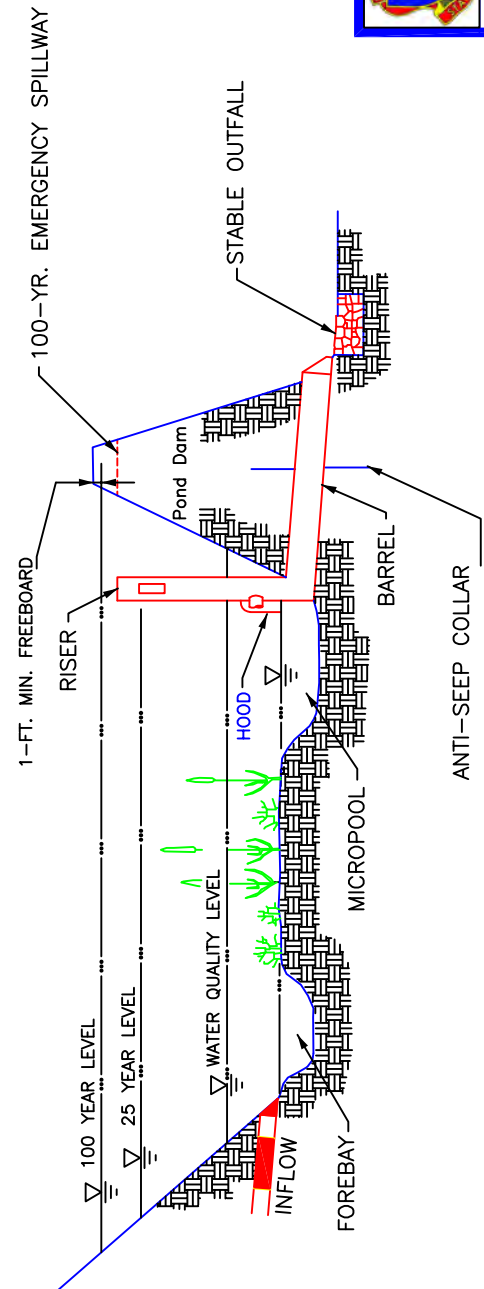
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Land Disturbance Handbook**

**WET EXTENDED DETENTION POND**

STANDARD DRAWING NO. WQ-02 Page 2 of 2



PLAN VIEW



PROFILE



Fort Jackson  
Land Disturbance Handbook

MICROPOOL EXTENDED DETENTION POND

STANDARD DRAWING NO. WQ-03 Page 1 of 2

## MICROPOOL EXTENDED DETENTION POND

The micropool extended pond is a variation of the wet extended detention pond where only a small "micropool" is maintained at the outlet of the pond. The outlet structure is designed to detain the water quality volume for 24-hours. The micropool prevents re-suspension of previously settled sediments and prevents clogging of the low flow orifice.

### Installation:

A forebay shall be provided for all inlets to a micropool extended water quality pond and shall be placed upstream of the micropool area. The forebay is separated from the micropool by a berm that may be constructed of earth, stones, riprap, gabions, or geotextiles. The top of the forebay barrier shall be equal to the normal pool elevation, and may extend above the elevation of the permanent pool. A TRM lined low flow channel shall be constructed to convey flow from the forebay to the micropool area.

The micropool shall be four (4) to six (6) feet in depth.

A low flow orifice shall be installed to slowly release the water quality volume. The low flow orifice shall be protected from clogging by designing appropriate trash guards. Acceptable trash guards include:

Hoods that extend at least 6-inches below the water quality pool water surface elevation.

Reverse flow pipes where the outlet structure inlet is located at least 6-inches below the water quality water surface elevation.

Emergency spillways shall be installed to pass the post-development 100-year 24-hour storm event without overtopping any dam structures.

### Inspection and Maintenance:

The side slopes of the pond shall be mowed monthly.

Since decomposing vegetation captured in the wetpond can release pollutants, especially nutrients, it may be necessary to harvest dead vegetation annually. Otherwise the decaying vegetation can export pollutants out of the pond and can cause nuisance conditions to occur.

Debris shall be cleared from all inlet and outlet structures monthly.

All eroded or undercut areas shall be repaired as needed.

A sediment marker shall be placed in the forebay to determine when sediment removal is required.

Sediment accumulations in the main pond area shall be monitored and sediment shall be removed when the permanent pool volume has been significantly filled and/or the pond becomes eutrophic.

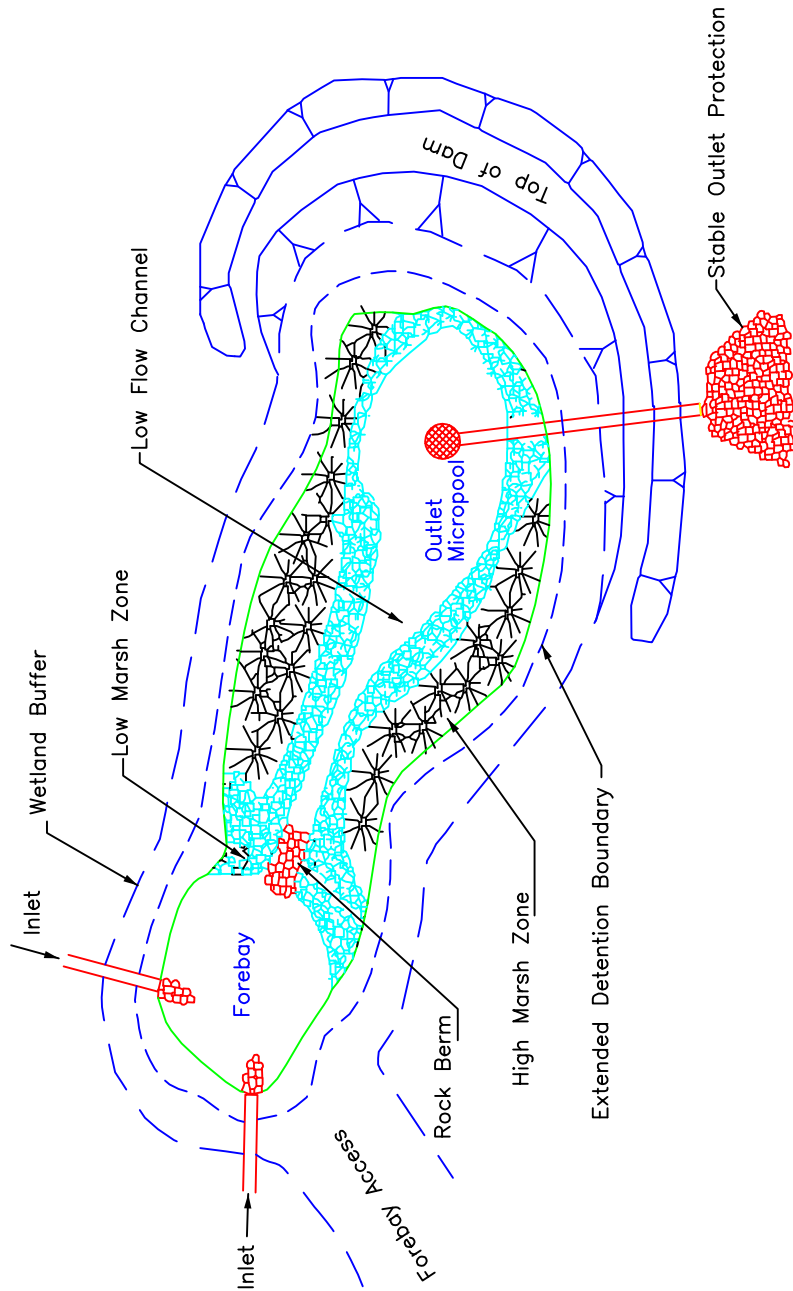


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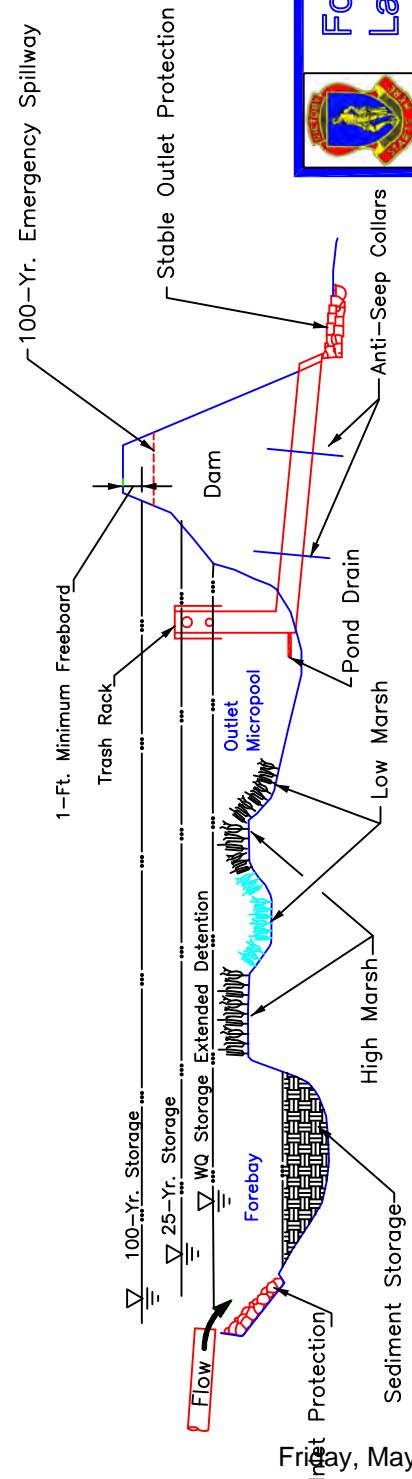
**MICROPOOL EXTENDED DETENTION POND**

STANDARD DRAWING NO. **WQ-03** Page 2 of 2





PLAN VIEW



PROFILE



Fort Jackson  
Land Disturbance Handbook

STORM WATER WETLAND



**STORM WATER WETLAND**When and Where to Use It

Constructed shallow marsh system that is designed to treat both urban storm water runoff and control runoff volume. As storm water runoff flows through the wetland, pollutant removal is achieved through settling and uptake by marsh vegetation.

Installation:

One-half (1/2) of the total shallow water zone shall be designated as being a high marsh. This zone extends up from 6–inches below the permanent pool water level (6–inches deep).

One-half (1/2) of the total shallow water zone shall be designated as low marsh. This zone extends from a depth of 18– to 6–inches below the permanent pool water level.

All inlets shall discharge to the forebay, and be protected with a properly designed Turf Reinforcement Mat. The forebay shall be constructed of a rock berm that shall be no lower than one (1)–foot below the water quality pool depth. A lined low flow channel shall be constructed to convey flow from the forebay to the micropool area.

The outlet micropool shall be required to allow adequate depth for the extended detention release outlet to function properly and allow a drain to be installed to drain the wetland when needed. The outlet micropool shall be 4–6 feet deep.

The water quality orifice shall be protected from clogging by incorporating an appropriate trash guard. The trash guard selected shall be durable and extend at least six (6)–inches below the normal pool surface of the wetland.

A principle spillway of the constructed storm water wetland shall be installed to safely pass the 25–year 24–hour storm event. The spillway shall be equipped with a trash rack.

An emergency spillway shall be installed to safely convey discharges resulting from the 100–year 24–hour storm event.

Inspection and Maintenance:

Maintenance requirements for constructed storm water wetlands are particularly high while vegetation is being established. Monitoring during the first year is critical to the success of the wetland. Wetlands shall be monitored after all storm events greater than 2–inches of rainfall during the first year to assess erosion, flow channelization and sediment accumulation. Inspection shall be made at least once every 6–months during the first 3–years of establishment.

A sediment cleanout stake shall be placed in the forebay area to determine when sediment removal is required.

Debris shall be removed from inlet and outlet structure monthly and all eroded or undercut areas repaired as frequently as necessary.

Wetland vegetation shall be monitored and replaced as necessary once every 6–months during the first 3–years of establishment. The depth of the zones within the wetland shall be inspected and maintained annually, and invasive vegetation shall be removed annually.

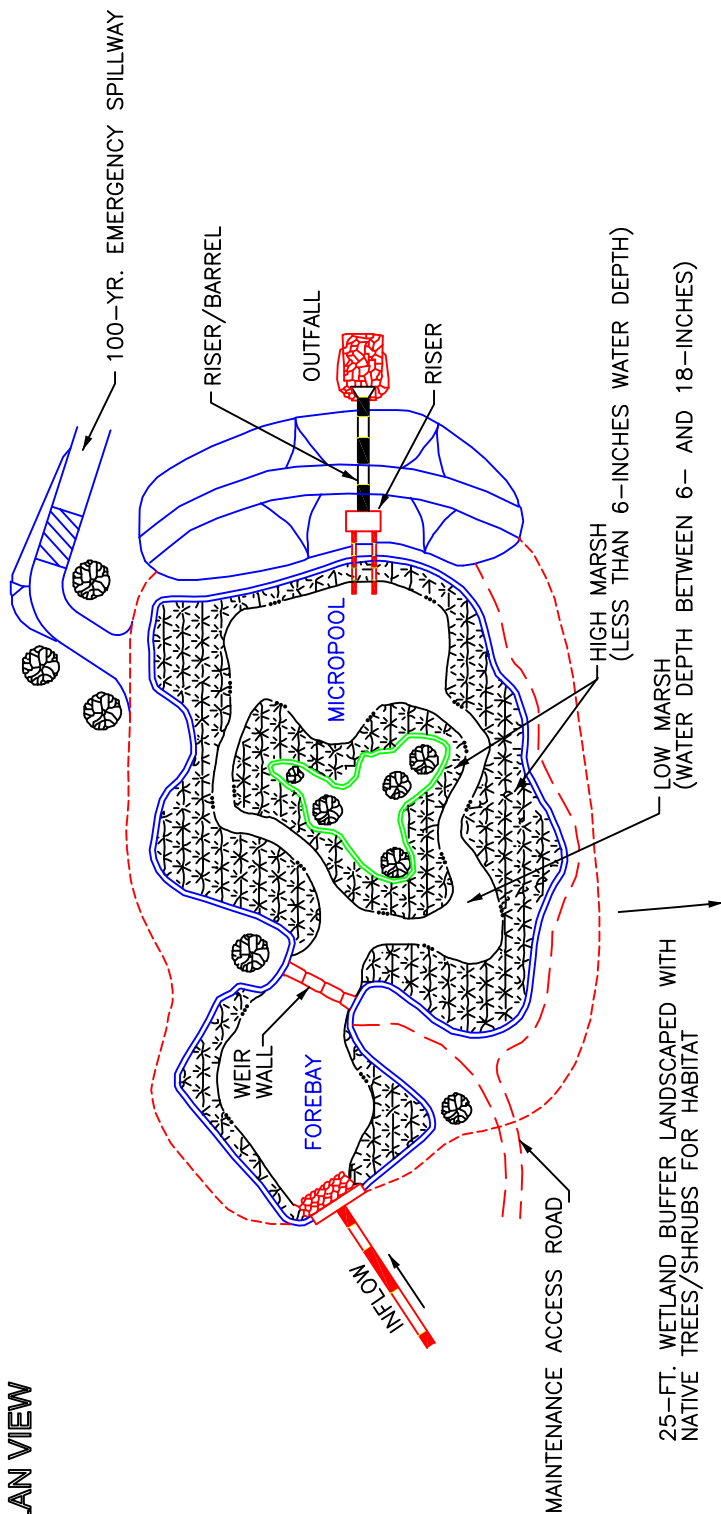


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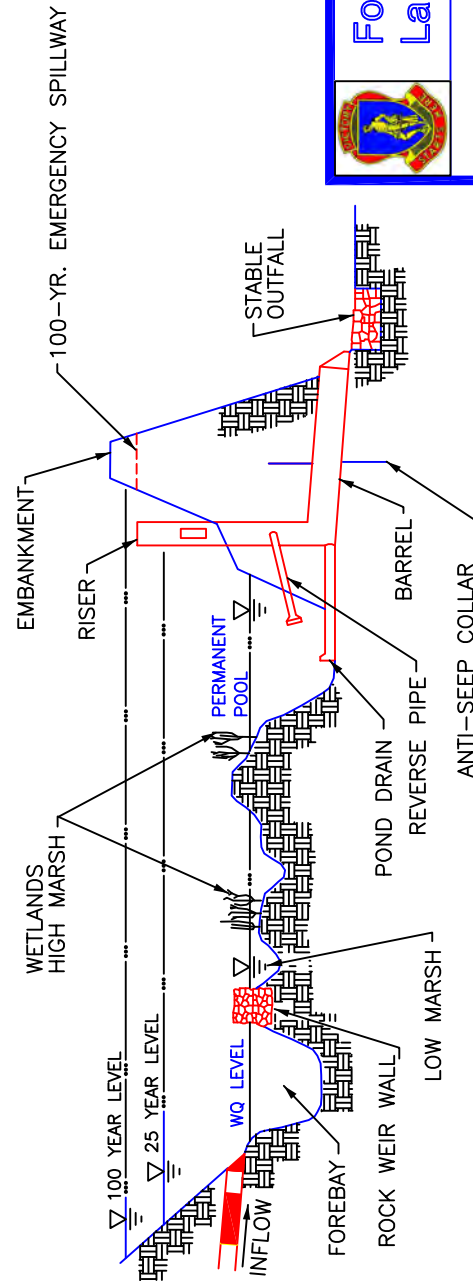
**STORM WATER WETLAND**

STANDARD DRAWING NO. WQ-04 Page 2 of 2

PLAN VIEW



25-Ft. WETLAND BUFFER LANDSCAPED WITH NATIVE TREES/SHRUBS FOR HABITAT



Fort Jackson  
Land Disturbance Handbook

SHALLOW WETLAND

STANDARD DRAWING NO. WQ-05 Page 1 of 2

PROFILE

Friday, May 27, 2011

## SHALLOW WETLAND

### When and Where to Use It

Shallow wetlands provide high water quality benefits for urban runoff. A disadvantage of shallow wetlands is that a relatively large amount of land is required to store the desired water quality volume in the low- and high-marsh areas.

### Installation:

One-half (1/2) of the total shallow water zone shall be designated as being a high marsh. This zone extends up from 6-inches below the permanent pool water level (6-inches deep).

One-half (1/2) of the total shallow water zone shall be designated as low marsh. This zone extends from a depth of 18- to 6-inches below the permanent pool water level.

All inlets shall discharge to the forebay, and be protected with a properly designed Turf Reinforcement Mat. The forebay shall be constructed of a rock berm that shall be no lower than the water quality pool depth.

The outlet micropool shall be required to allow adequate depth for the extended detention release outlet to function properly and allow a drain to be installed to drain the wetland when needed. The outlet micropool shall be 4-6 feet deep.

The water quality orifice shall be protected from clogging by incorporating an appropriate trash guard. The trash guard selected shall be durable and extend at least six (6)-inches below the normal pool surface of the wetland.

A principle spillway of the constructed storm water wetland shall be installed to safely pass the 25-year 24-hour storm event. The spillway shall be equipped with a trash rack.

An emergency spillway shall be installed to safely convey discharges resulting from the 100-year 24-hour storm event.

### Inspection and Maintenance:

Maintenance requirements for constructed storm water wetlands are particularly high while vegetation is being established. Monitoring during the first year is critical to the success of the wetland. Wetlands shall be monitored after all storm events greater than 2-inches of rainfall during the first year to assess erosion, flow channelization and sediment accumulation. Inspection shall be made at least once every 6-months during the first 3-years of establishment.

A sediment cleanout stake shall be placed in the forebay area to determine when sediment removal is required.

Debris shall be removed from inlet and outlet structure monthly and all eroded or undercut areas repaired as needed.

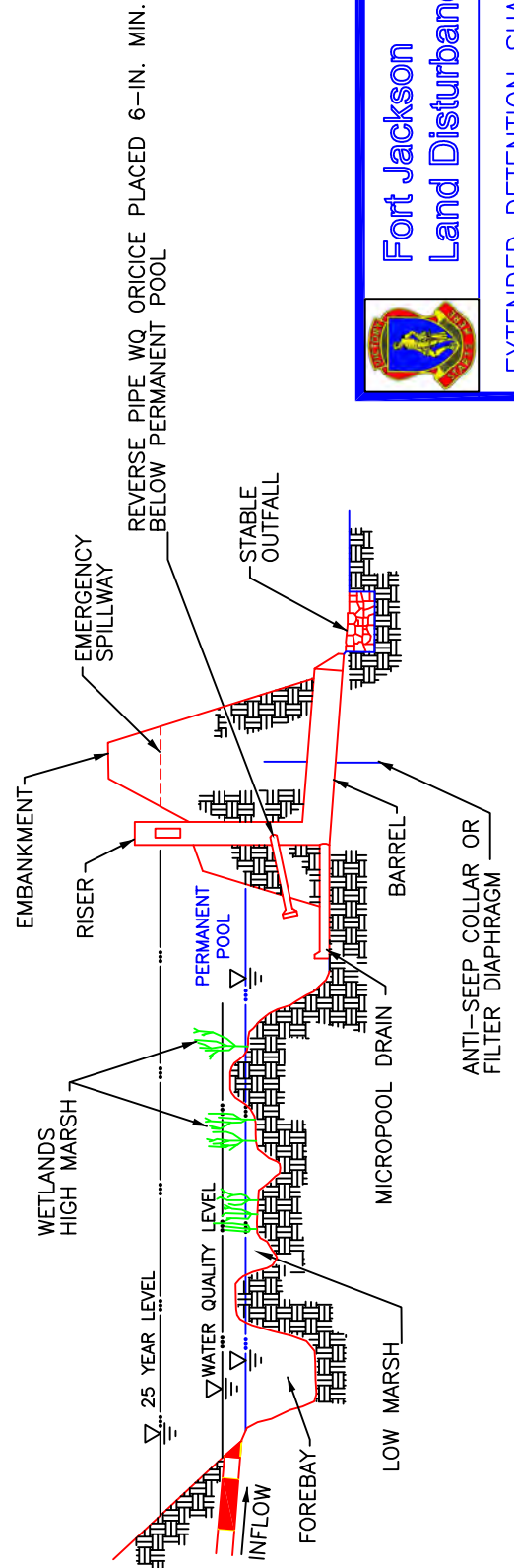
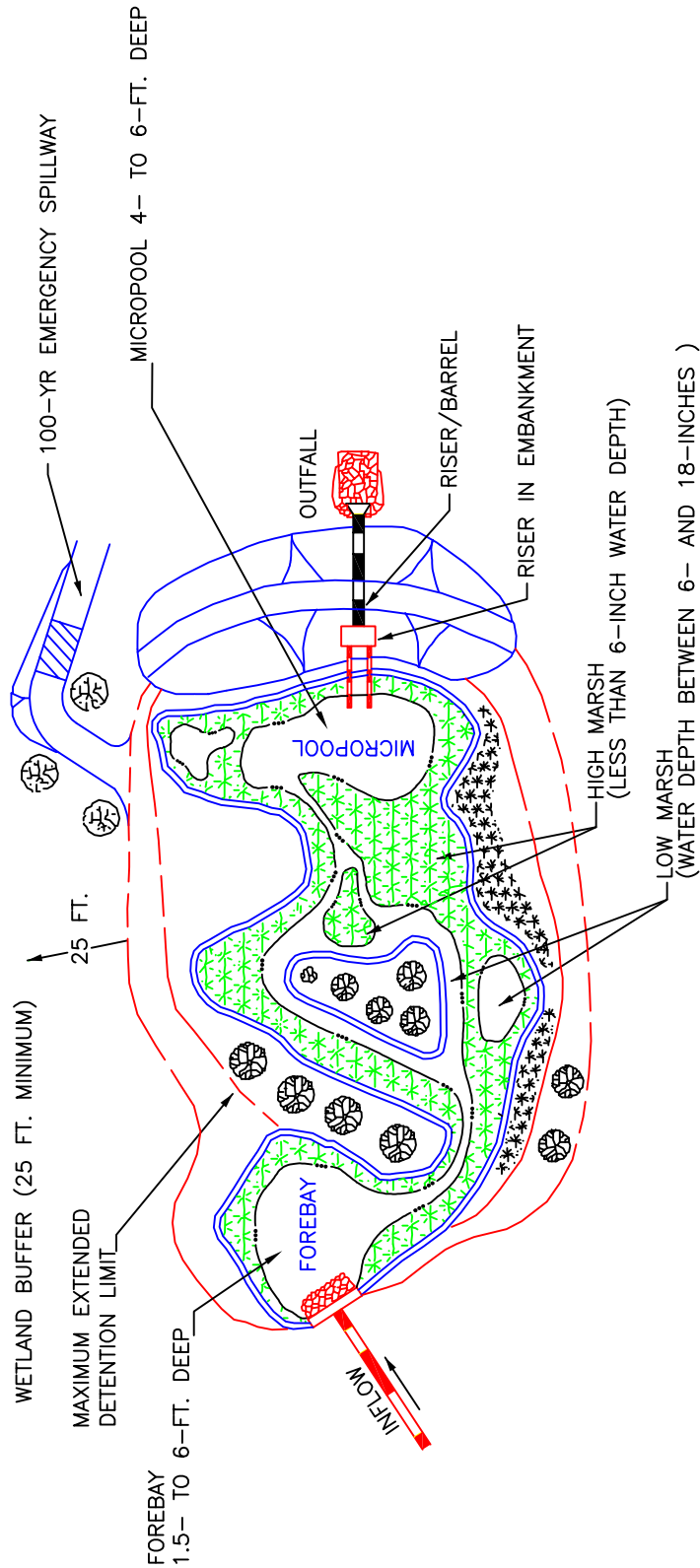
Wetland vegetation shall be monitored and replaced as necessary once every 6-months during the first 3-years of establishment. The depth of the zones within the wetland shall be inspected and maintained annually, and invasive vegetation shall be removed annually.



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**SHALLOW WETLAND**

STANDARD DRAWING NO. WQ-05 Page 2 of 2



Fort Jackson  
Land Disturbance Handbook

EXTENDED DETENTION SHALLOW WETLAND

STANDARD DRAWING NO. WQ-06 Page 1 of 2

## EXTENDED DETENTION SHALLOW WETLAND

### When and Where to Use It

This application can treat a greater volume of storm water in a smaller space than the shallow wetland design because part of the water quality treatment volume is provided as extended detention above the surface of the marsh and is released over a period of 24–hours. Plants that can tolerate both wet and dry periods are required in the extended detention area.

### Installation:

One–half (1/2) of the total shallow water zone shall be designated as being a high marsh. This zone extends up from 6–inches below the permanent pool water level (6–inches deep).

One–half (1/2) of the total shallow water zone shall be designated as low marsh. This zone extends from a depth of 18– to 6–inches below the permanent pool water level.

All inlets shall discharge to the forebay, and be protected with a properly designed Turf Reinforcement Mat. The forebay shall be constructed of an earthen berm that shall be no lower than the normal permanent pool depth.

The outlet micropool shall be required to allow adequate depth for the extended detention release outlet to function properly and allow a drain to be installed to drain the wetland when needed. The outlet micropool shall be 4–6 feet deep.

The water quality orifice shall be protected from clogging by incorporating an appropriate trash guard. The trash guard selected shall be durable and extend at least six (6)–inches below the normal pool surface of the wetland.

A principle spillway of the constructed storm water wetland shall be installed to safely pass the 25–year 24–hour storm event. The spillway shall be equipped with a trash rack.

An emergency spillway shall be installed to safely convey discharges resulting from the 100–year 24–hour storm event.

### Inspection and Maintenance:

Maintenance requirements are particularly high while vegetation is being established. Monitoring during the first year is critical to the success of the wetland, and should be done after all storm events greater than 2–inches of rainfall to assess erosion, flow channel–ization and sediment accumulation. Inspection shall be made at least once every 6–months during the first 3–years of establishment.

A sediment cleanout stake shall be placed in the forebay area to determine when sediment removal is required.

Debris shall be removed from inlet and outlet structure monthly and all eroded or undercut areas repaired as needed.

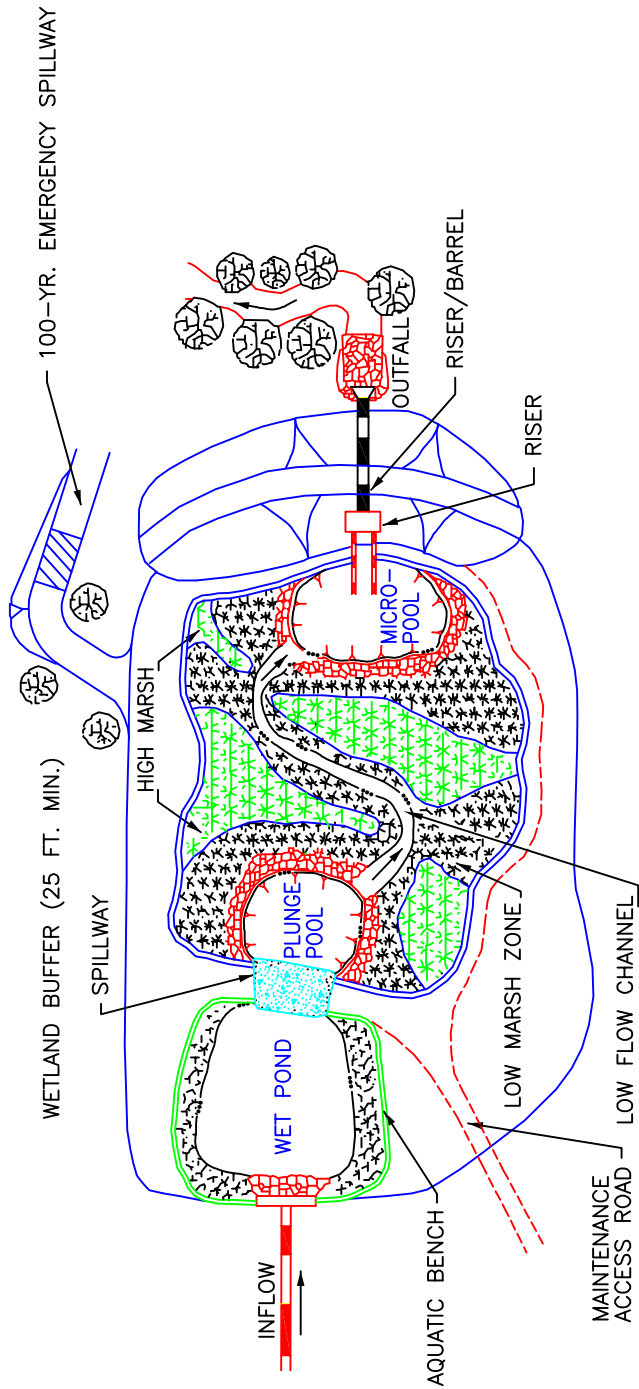
Wetland vegetation shall be monitored and replaced as necessary once every 6–months during the first 3–years of establishment. The depth of the zones shall be inspected and maintained annually and invasive vegetation shall be removed annually.



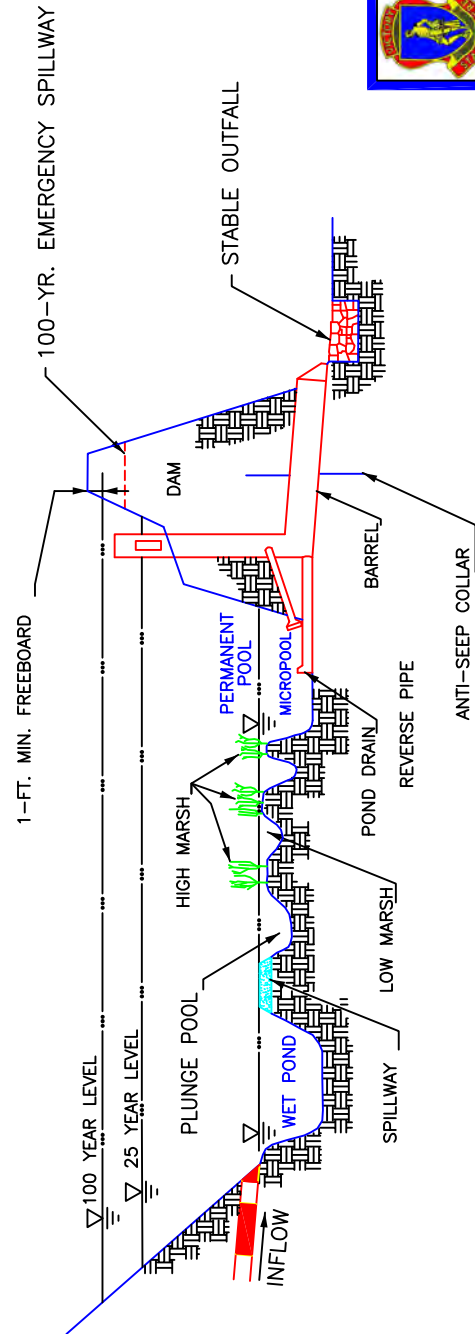
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EXTENDED DETENTION SHALLOW WETLAND

STANDARD DRAWING NO. WQ–06 Page 2 of 2



PLAN VIEW



Friday, May 27, 2011



Fort Jackson  
Land Disturbance Handbook

POND/WETLAND SYSTEM



## POND/WETLAND SYSTEM

### When and Where to Use It

The system has two separate cells, a wet pond and a shallow marsh. The wet pond is designed to trap sediment and reduce runoff velocities before the runoff enters the shallow marsh. The primary water quality benefits are achieved in the shallow wetland. Less land is required for the pond/wetland system than the shallow wetland and the extended detention shallow wetland.

### Installation:

One-half ( $\frac{1}{2}$ ) of the total shallow water zone shall be high marsh. This zone extends up from 6-inches below the permanent pool water level (6-in deep). One-half ( $\frac{1}{2}$ ) of the total shallow water zone shall be low marsh. This zone extends from a depth of 18-inches to 6-inches below the permanent pool water level.

All inlets shall discharge to wet pond area, and be protected with a Turf Reinforcement Mat or other acceptable inlet protection. The wet pond shall be 4- to 6-feet deep and have a designed overflow spillway that discharges to a plunge pool. The plunge pool shall be 4- to 6-feet deep that having a lined low flow channel to convey flow from the plunge pool to the micropool area.

The outlet micropool shall be required to allow adequate depth for the extended detention release outlet to function properly and allow a drain to be installed to drain the wetland when needed. The outlet micropool shall be 4-6 feet deep.

The water quality orifice shall be protected from clogging by incorporating an appropriate trash guard. The trash guard selected shall be durable and extend at least six (6)-inches below the normal pool surface of the wetland.

A principle spillway of the constructed storm water wetland shall be installed to safely pass the 25-year 24-hour storm event. The spillway shall be equipped with a trash rack.

An emergency spillway shall be installed to safely convey discharges resulting from the 100-year 24-hour storm event.

### Inspection and Maintenance:

Maintenance requirements for constructed storm water wetlands are particularly high while vegetation is being established. Monitoring during the first year is critical to the success of the wetland. Wetlands shall be monitored after all storm events > 2-inches of rainfall during the first year to assess erosion, flow channelization and sediment accumulation. Inspection shall be made at least once every 6-months during the first 3-years of establishment.

A sediment cleanout stake shall be placed in the forebay area to determine when sediment removal is required.

Debris shall be removed from inlet and outlet structure monthly and all eroded or undercut areas repaired as needed..

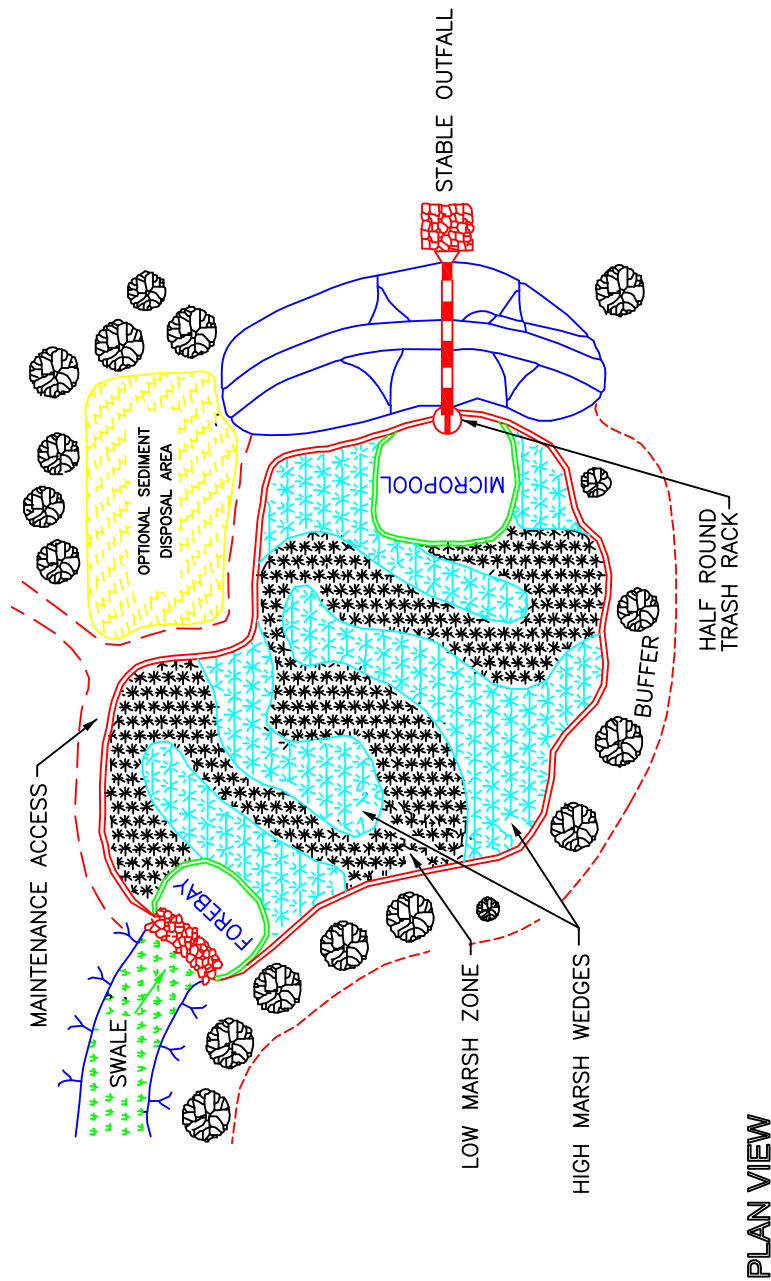
Wetland vegetation shall be monitored and replaced as necessary once every 6-months during the first 3-years of establishment. The depth of the zones shall be inspected and maintained annually, and invasive vegetation shall be removed annually.



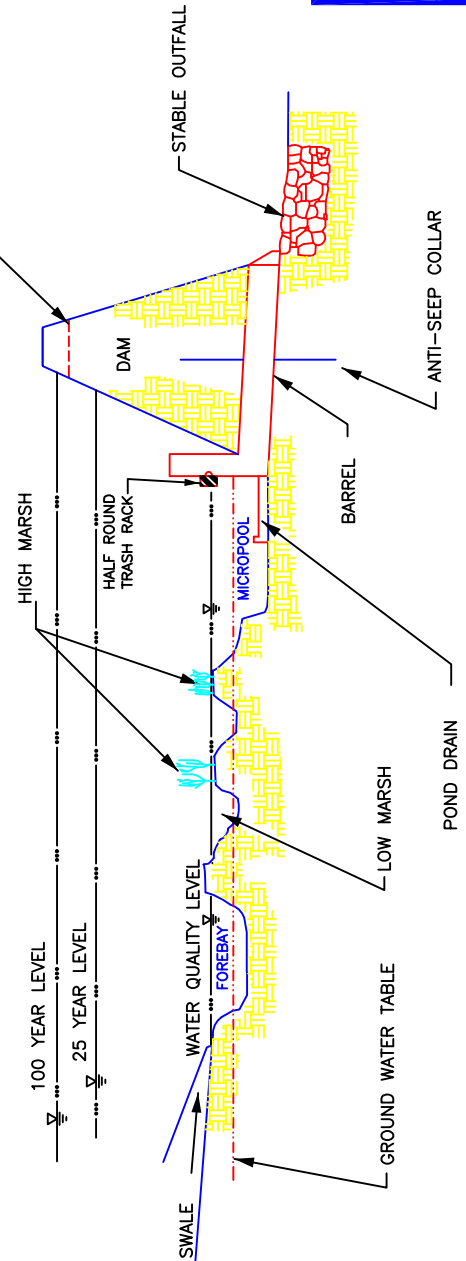
**Fort Jackson**  
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**POND/WETLAND SYSTEM**

STANDARD DRAWING NO. WQ-07 Page 2 of 2



100-YR. EMERGENCY SPILLWAY



Friday, May 27, 2011



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Land Disturbance Handbook

POCKET WETLAND

STANDARD DRAWING NO. WQ-08 Page 1 of 2



## POCKET WETLAND

### When and Where to Use It

A pocket wetland is intended for smaller drainage areas from 5 to 10 acres, and requires excavating down to the water table for a reliable source of water to support the wetland vegetation.

### Installation:

One-half ( $\frac{1}{2}$ ) of the total shallow water zone shall be designated as being a high marsh, the other as low marsh. The high zone extends up from 6-inches below the permanent pool water level (6-inches deep). The low marsh extends from a depth of 18- to 6-inches below the permanent pool water level.

All inlets shall discharge to forebay through open vegetated swales. The forebay is separated from the pocket wetland area by barriers or baffles that may be constructed of earth, stones, riprap, gabions, or geotextiles. The top of the forebay shall be equal to or may extend above the water quality permanent pool elevation.

The outlet micropool shall be required to allow adequate depth for the extended detention release outlet to function properly and allow a drain to be installed to drain the wetland when needed. The outlet micropool shall be 4- to 6-feet deep.

The water quality orifice shall be protected from clogging by incorporating an appropriate trash guard. The trash guard selected shall be durable and extend at least six (6)-inches below the normal pool surface of the micropool.

A principle spillway of the constructed storm water wetland shall be installed to safely pass the 25-year 24-hour storm event. The spillway shall be equipped with a trash rack.

An emergency spillway shall be installed to safely convey discharges resulting from the 100-year 24-hour storm event.

### Inspection and Maintenance:

Maintenance requirements for constructed storm water wetlands are particularly high while vegetation is being established. Monitoring during the first year is critical to the success of the wetland. Wetlands shall be monitored after all storm events greater than 2-inches of rainfall during the first year to assess erosion, flow channelization and sediment accumulation. Inspection shall be made at least once every 6-months during the first 3-years of establishment.

A sediment cleanout stake shall be placed in the forebay area to determine when sediment removal is required.

Debris shall be removed from inlet and outlet structure monthly and all eroded or undercut areas repaired as needed..

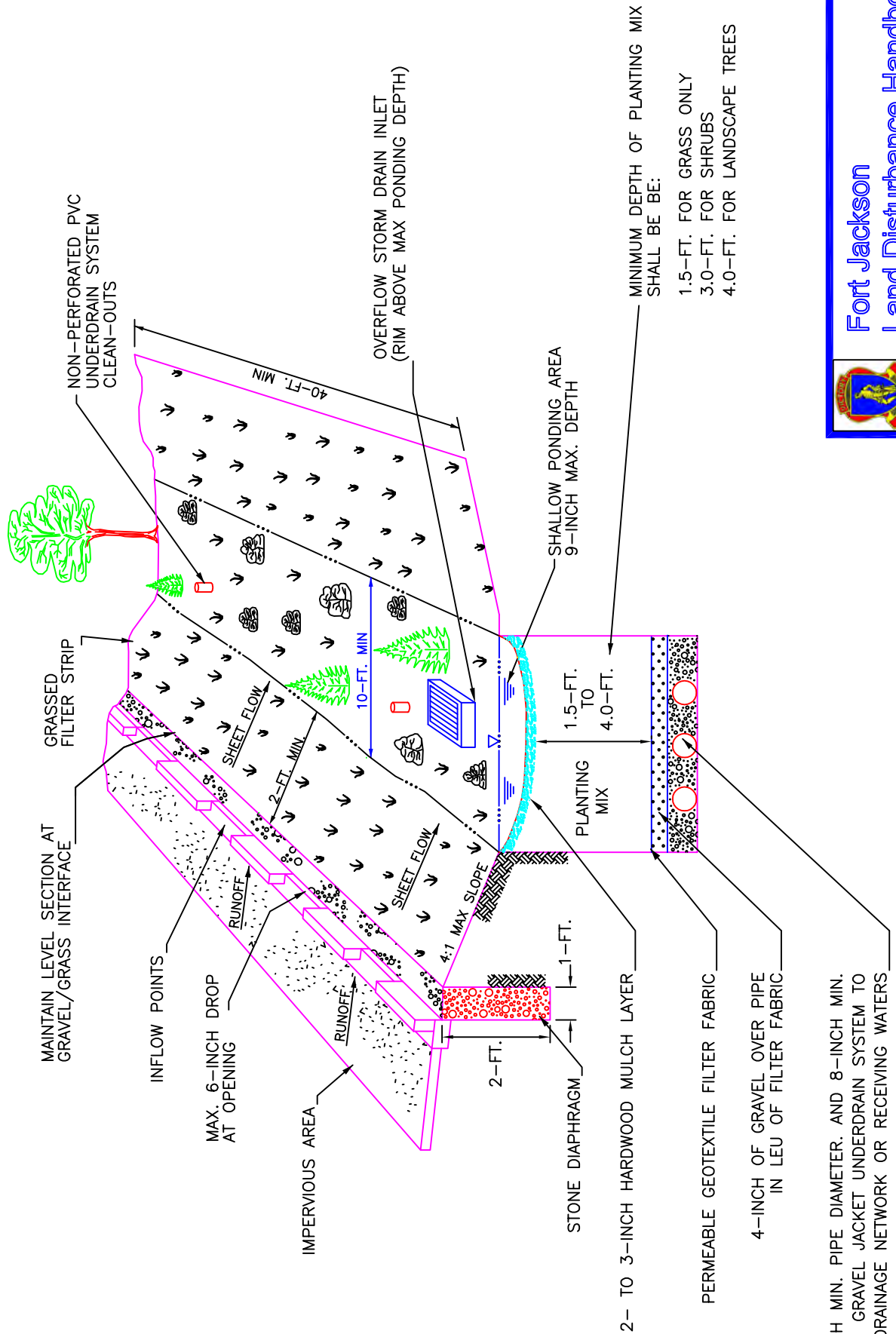
Wetland vegetation shall be monitored and replaced as necessary once every 6-months during the first 3-years of establishment. The depth of the zones shall be inspected and maintained annually, and invasive vegetation shall be removed annually.



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**POCKET WETLAND**

STANDARD DRAWING NO. WQ-08 Page 2 of 2

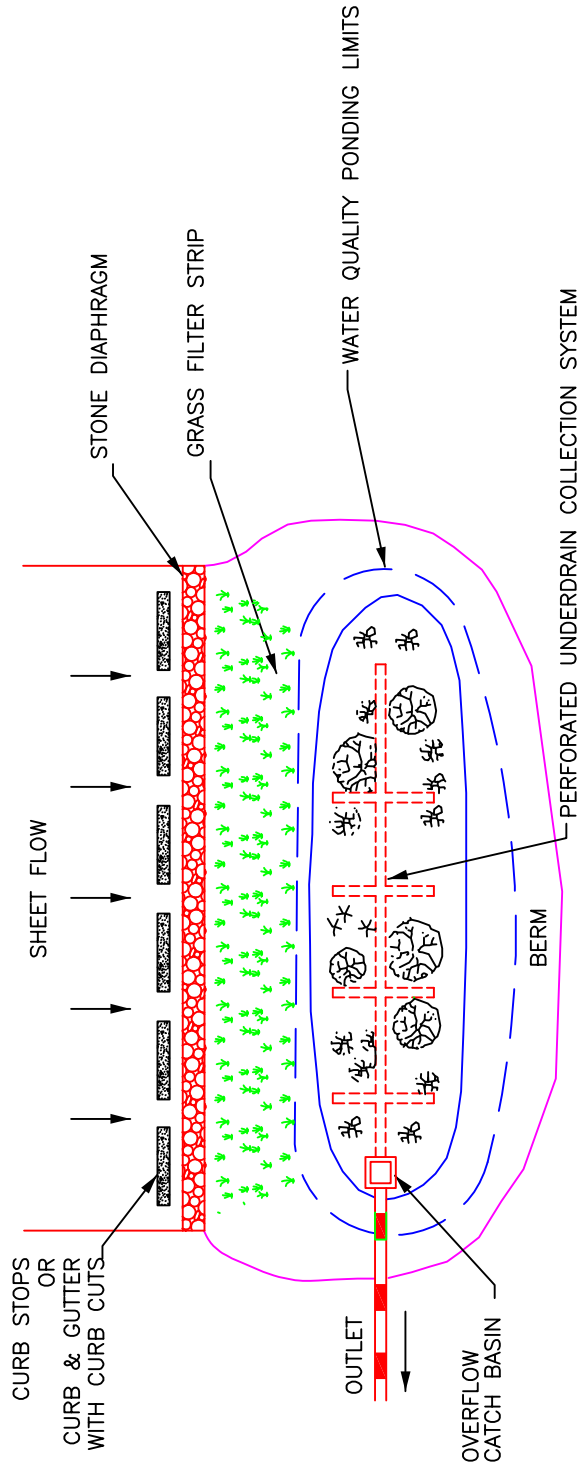


# Fort Jackson Land Disturbance Handbook

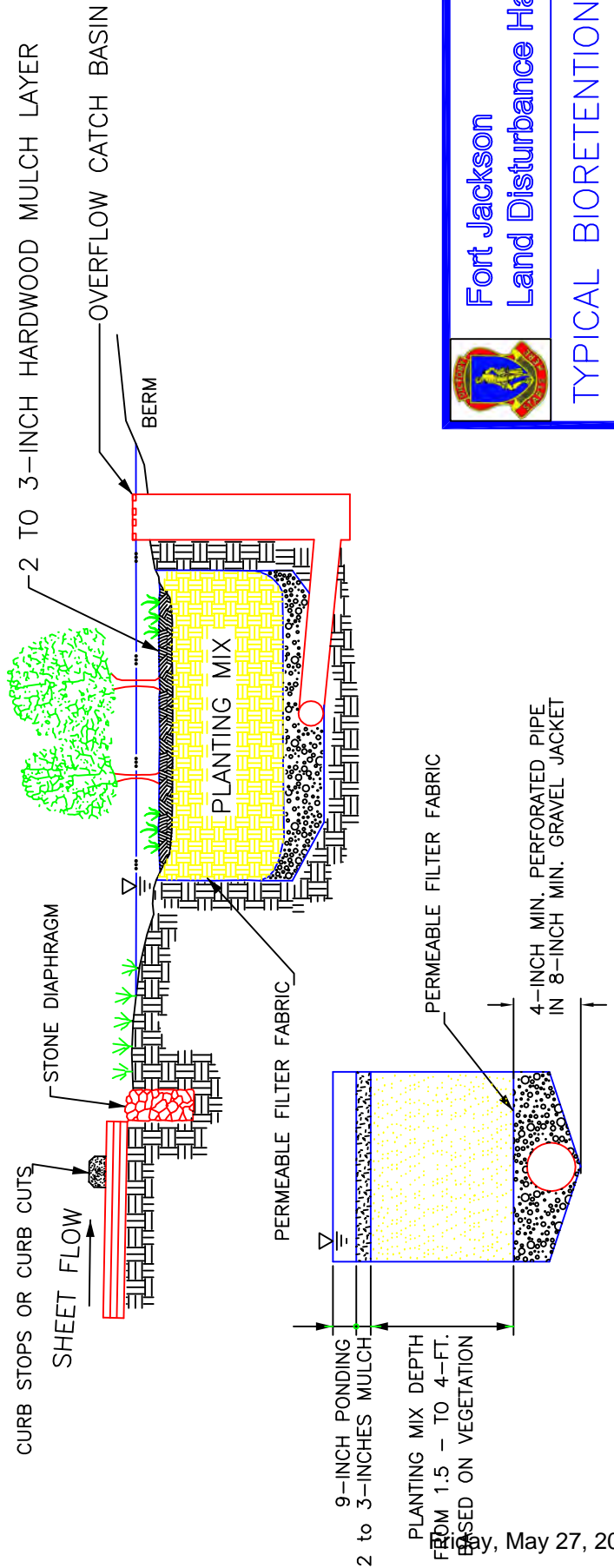
## TYPICAL BIORETENTION AREA

STANDARD DRAWING NO. WQ-09 Page 1 of 3

SOURCE: ADAPTED FROM PRINCE GEORGE'S COUNTY DESIGN MANUAL FOR THE USE OF BIORETENTION IN STORMWATER MANAGEMENT, 1993



PLAN VIEW



TYPICAL SECTION



Fort Jackson  
Land Disturbance Handbook

TYPICAL BIORETENTION AREA

STANDARD DRAWING NO. WQ-09 Page 2 of 3

## TYPICAL BIORETENTION AREA

### When and Where to Use It

Bioretention drainage areas should range from 1–2 acres and should only be placed where the contributing area is well stabilized to prevent excessive debris and sediment from collecting in the bioretention area.

### Installation:

Bioretention areas work best when constructed off–line, capturing only the water quality volume. Excess runoff shall be diverted away from the bioretention area or should be collected by an overflow catch basin.

The minimum width of the bioretention area shall be ten (10)–feet and the minimum length shall be forty (40)–feet.

The planting mix should be approximately 65–75% sand, 25% silt or topsoil, and 10% organic or leaf compost. The maximum clay content shall be less than 10%. The minimum depth of the planting mix shall be based on the following:

- 1.5–feet for grass only bioretention areas,
- 3.0–feet for bioretention areas that utilize shrubs, and
- 4.0–feet for bioretention areas that utilize trees.

The under drain system shall consist of a minimum 4–inch diameter perforated PVC pipe, an 8–inch minimum gravel jacket filter layer, and geotextiles to separate the piping from the native soils and the gravel from the planting mixture. Several non–perforated PVC pipes shall vertically connect to the under drain pipe and extend to the surface of the planting mix to provide access to clean out the perforated drainage pipe.

An overflow system shall be designed to pass runoff volumes greater than the water quality volume away from the bioretention area. If the bioretention area collects sheet flow from a parking area, a catch basin shall be designed to be at the elevation of the maximum 9–inch ponding depth of the bioretention area to carry the excess runoff from the bioretention area to the storm sewer system or receiving natural water system.

### Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of bioretention areas as designed. Maintenance responsibility of the bioretention area shall be vested with a responsible authority by means of a legally binding and enforceable maintenance agreement that is executed as a condition of plan approval.

The surface of the ponding area may become clogged with fine sediments over time. Core aeration or cultivating unvegetated areas may be required to ensure adequate aeration.

Other required maintenance includes but is not limited to:

- Pruning and weeding to maintain appearance shall be done periodically as needed.
- Hardwood mulch shall be replaced or replenished 2–to 3–inches thick as needed.
- Rash and debris shall be removed periodically as needed.

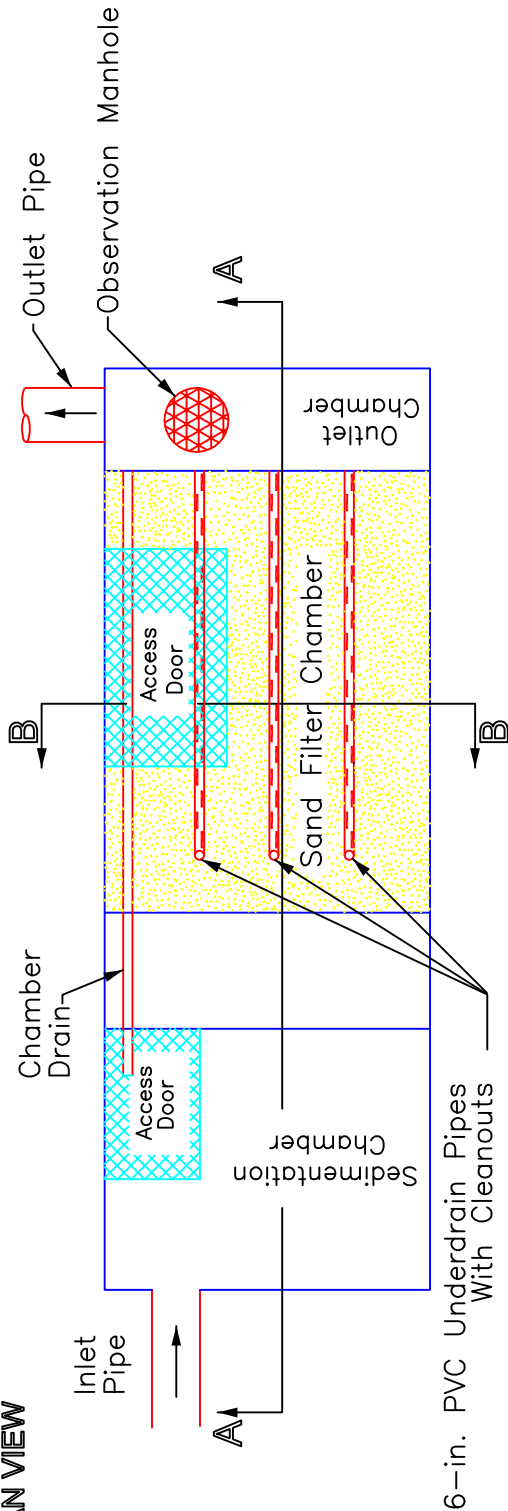


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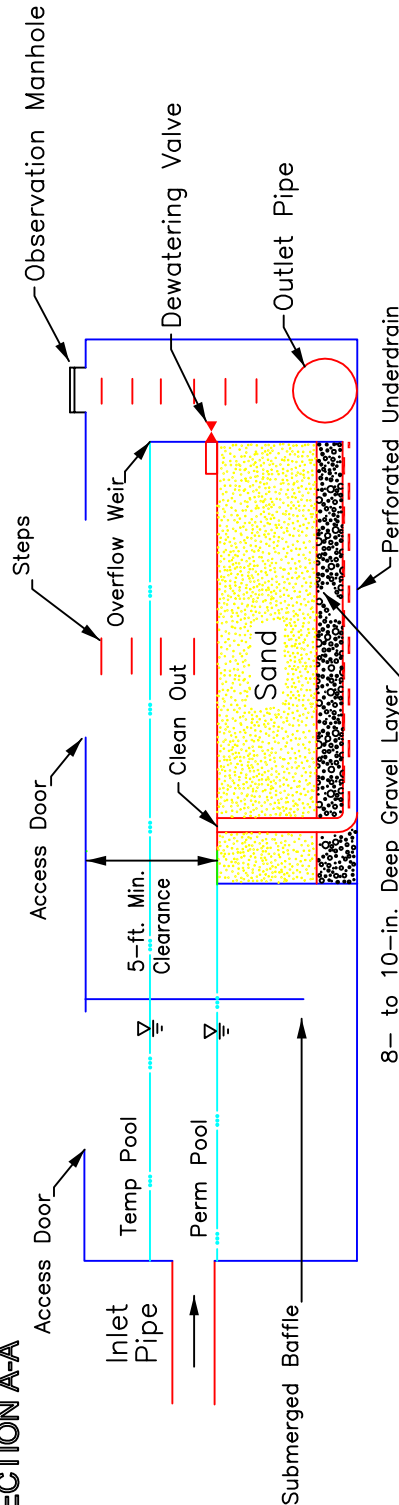
**TYPICAL BIORETENTION AREA**

STANDARD DRAWING NO. **WQ–09** Page 3 of 3

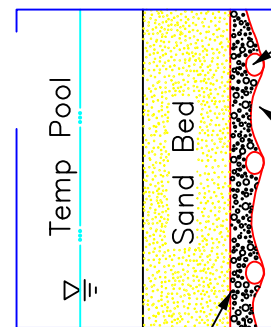
# PLAN VIEW



## SECTION A-A



## SECTION B-B



## SAND FILTERS

### When and Where to Use It

Sand filtration facilities are most applicable for smaller sites of 5 acres or less where the percent imperviousness of the site is very high. Sand filters shall be used on sites where the drainage area to the facility will remain well stabilized after the construction phase to prevent excess sediment and debris from permanently clogging the filter.

It is recommended that individual sand filters be sized to treat relatively small drainage area of 1 to 2 acres. The implementation of several filters on the site will prevent the entire site from being untreated if one of the filter facilities becomes clogged, requiring maintenance.

### Installation:

A 5-foot minimum clearance height shall be provided between the top of the sand bed and the bottom of the concrete slab to provide clearance for maintenance. A de-watering valve shall be placed just above the sand bed layer to drain the facility in situation where the sand filter becomes clogged and requires maintenance.

An under drain system shall be used to collect the runoff water that has percolated through the sand filter. The pipe shall be 6-inch perforated schedule 40 PVC piping placed in a 8- to 10-inch deep gravel jacket. A permeable geotextile filter fabric that meets Fort Jackson specifications shall be placed between the sand and the gravel. To ensure adequate drainage, the bottom chamber shall be sloped towards the under drain pipes that shall be spaced 10-feet apart along the filter bed. The under drain system may discharge to the main storm sewer system or may outfall to an outlet chamber.

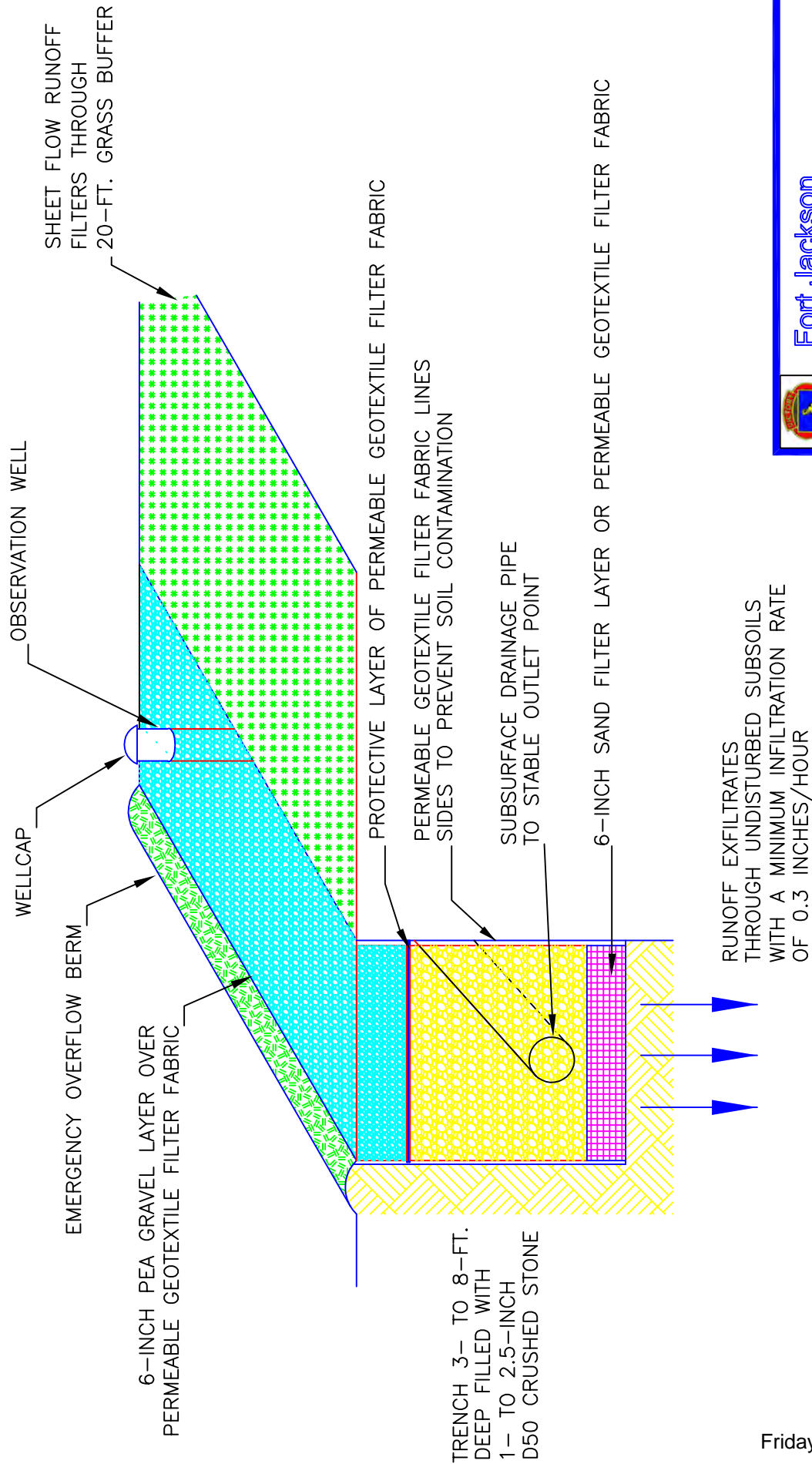
### Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of sand filter facilities as designed. Maintenance responsibility for the sand filter shall be vested with a responsible authority by means of a legally binding and enforceable maintenance agreement that is executed as a condition of plan approval. Typical maintenance responsibilities include clearing debris and trash from all inlet and outlet structures monthly, removing trash and debris from the sediment chamber monthly, and removing all sediment from the sediment chamber annually.

A record shall be kept of the average de-watering time of the sand filter facility to determine if maintenance is required. When the filtering capacity of the sand has diminished, the top layers of the sand (2- to 3-inches) shall be removed and replaced. This typically will need to be done every 3- to 5-years.







SCHEMATIC OF AN INFILTRATION TRENCHES



INFILTRATION TRENCH

When and Where to Use It

Infiltration trenches are limited to areas with highly porous soils where the water table and or bedrock are located well below the bottom of the trench. The maximum drainage area for any one-infiltration trench shall be 5 acres. Infiltration trenches shall not be used for manufacturing and industrial sites where there is potential for high concentrations of soluble pollutants and heavy metals.

Installation:

The minimum depth of the excavated trench shall be 3-feet, the maximum depth shall be 8-feet, and the trench shall be lined with a permeable filter fabric.

The maximum width of the infiltration trench shall be twenty-five (25)-feet.

The trench excavation shall be limited to the width a depth specified in the design. Excavated material should be placed away from the open trench. The bottom of the excavated trench shall not be loaded or compacted, and should be scarified before the placement of sand or filter fabric. The sides of the trench shall be trimmed of all large roots. The sidewalls should be uniform with no voids and scarified prior to the installation of the protective filter fabric.

A 6-inch sand filter shall be located on the bottom of the trench.

The stone fill media shall consist of 1.0- to 2.5- inch D50 crushed stone with 6-inches of pea gravel located on top separated by a permeable filter fabric. This filter fabric prevents should be easily separated from the geotextiles that protect the sides of the excavated trench.

Observation wells a maximum of 100-ft apart shall be installed in every infiltration trench and shall be made of 4- to 6-inch PVC pipe. The well shall extend to the bottom of the trench. The observation well shall be installed along the centerline of the trench, and be flush with the ground elevation of the trench. The top of the well shall be capped and locked to discourage vandalism and tampering.

Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of infiltration trenches as designed. Maintenance responsibility shall be vested with a responsible authority by means of a legally binding and enforceable maintenance agreement that is executed as a condition of the SC DHEC Storm Water Management Permit approval.

A record shall be kept of the average de-watering time of the infiltration trench to determine if maintenance is required.

Debris and trash shall be cleared from all inlet and outlet structures monthly. Trees, shrubs, or invasive vegetation shall be removes semi-annually.

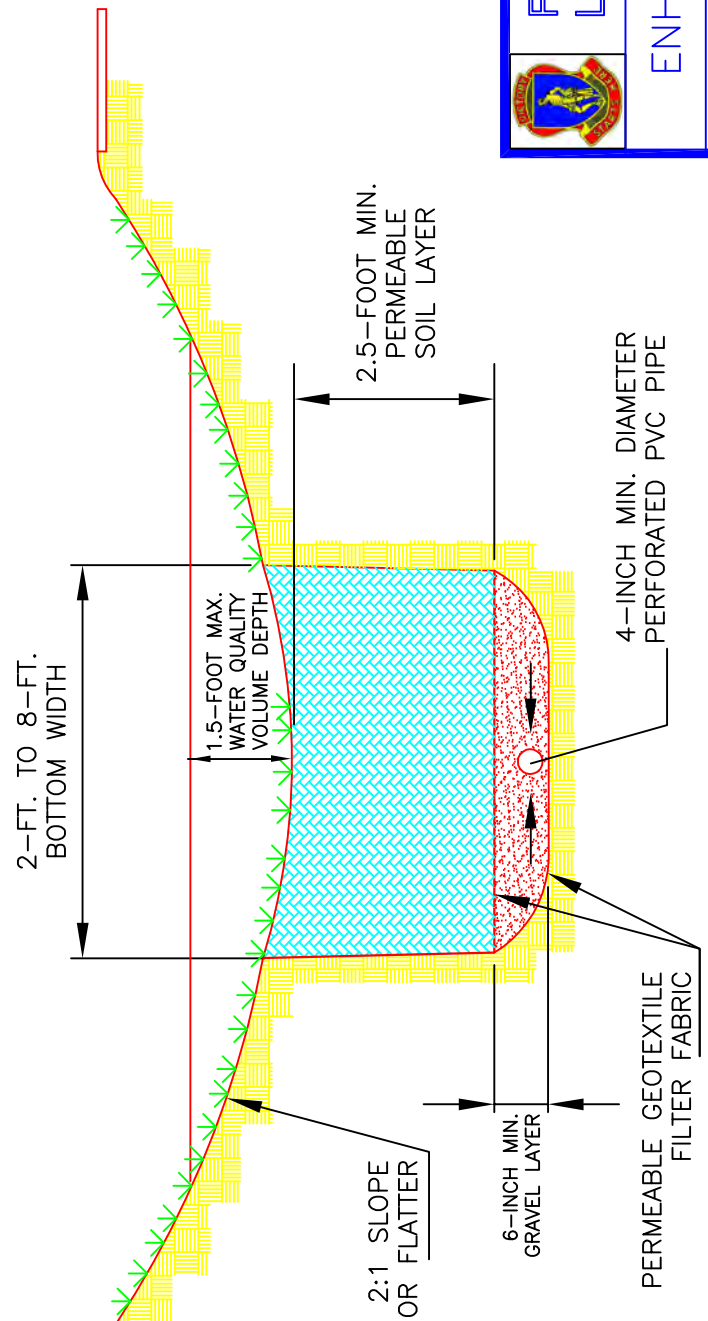
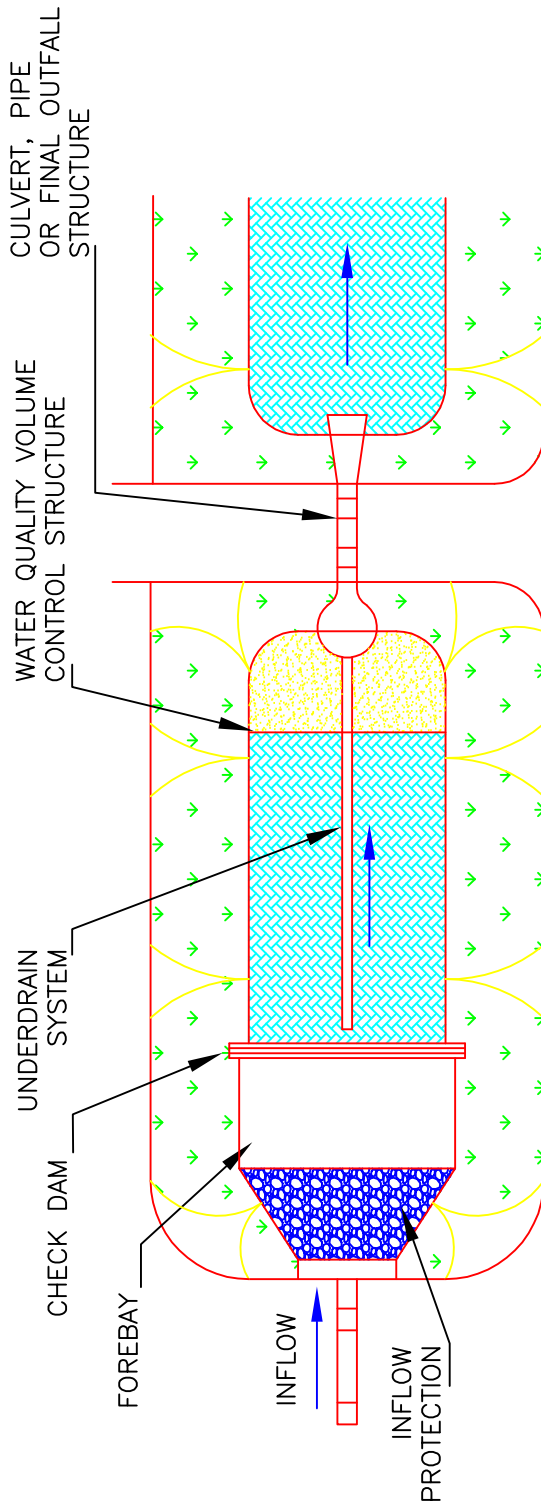
The top 6-inch layer of pea gravel and the geotextile separating the pea gravel from the stone media serve as a sediment barrier and will be required to be replaced when full of sediment.

The observation well shall be checked following 72 hours (3-days) of dry weather after a rainfall event. If complete de-watering is not observed, there may clogging and proper maintenance shall be performed.

If complete failure is observed, total rehabilitation of the trench shall be performed by excavating the trench walls to expose clean soil, and replacing the sand, filter media, gravel, and geotextiles.







## ENHANCED DRY SWALE

### When and Where to Use It

Enhanced swales are primarily applicable in moderate to large lot residential developments and industrial areas with low to moderate density where the impervious cover (parking lots and rooftops) of the contributing drainage areas is relatively small. Enhanced swale should have a contributing drainage area less than 5 acres. Enhanced swales are also useful along rural roads and highways that have driveway entrances crossing over the swale.

### Installation:

Swale slopes should be limited between 1 and 2 %, unless site topography dictates larger slopes. In this instance, drop structures may be placed in the swale to limit the slope of a particular section of the swale. Spacing between drop structures should be a minimum of 50–feet and energy dissipation techniques may need to be added on the downstream side of the drop structures.

The overall depth of the water quality runoff volume detained in the channel shall not exceed 1.5–feet.

The bottom width of the swale should range between 2– and 8–feet where applicable to ensure an adequate filtration area

The side slopes of the swale shall not exceed 2H:1V, and 4H:1V is recommended for ease of maintenance and for side inflow to remain as sheet flow.

The filter bed for an enhanced dry swale shall consist of a permeable soil layer at least 2.5–feet deep. The drainage pipe shall be a minimum 4–inch diameter perforated PVC pipe (AASHTO M 252) in a 6–inch gravel layer.

### Inspection and Maintenance:

The surface of the filter bed may become clogged with fine sediments over time. Light core aeration may be required to ensure adequate filtration. Other required maintenance includes but is not limited to periodic mowing to maintain the storage volume and to maintain appearance, and the periodic removal of trash and debris as needed.



## Fort Jackson Land Disturbance Handbook

### ENHANCED DRY SWALE

## PARKING LOT BIORETENTION ISLANDS

### Installation

The top width should be a minimum of 10–feet, and the depth should be at least 6–inches.

The slopes from the pavement into the island should be 2%.

Bioretention area shall be planted once all construction has ceased. Prior to planting, all debris and sediment that has collected in basin during construction shall be removed.

Minimize construction traffic over areas where bioretention areas are planned.

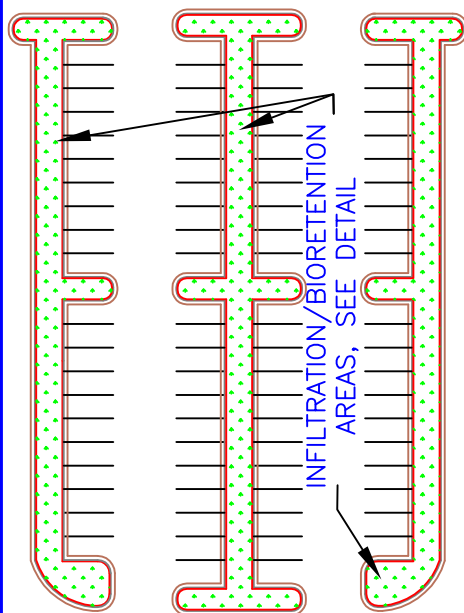
Specification of bioretention soils and plants is provided in other documents of the Fort Jackson Land Disturbance Handbook, specifically, Standard Drawing WQ 09.

### Inspection and Maintenance:

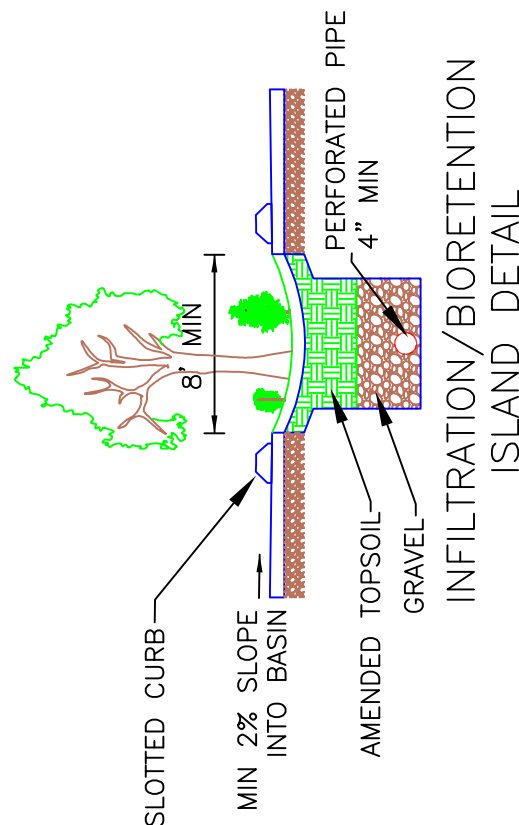
Islands should be inspected, every seven (7) calendar days and within 24–hours after each rainfall event that produces  $\frac{1}{2}$ –inches or more of precipitation and repairs made as necessary.

Damage caused by construction traffic or other activity must be repaired before the end of each working day.

All plantings shall be replaced once every 2–3 years as necessary.



PARKING LOT SCHEMATIC WITH  
BIORETENTION ISLANDS



Fort Jackson  
Land Disturbance Handbook

PARKING LOT  
BIORETENTION AREA

STANDARD DRAWING NO. WQ-13 Page 1 of 1

## BMP Standard Notes

### When and Where to Use It

These notes should appear on any design drawing that proposes using any type of structural BMPs. Additional information on any proposed BMP should be included in detail drawing(s). Fort Jackson encourages the use of various types of BMPs, provided sufficient detail and appropriateness of use is given.

### BMP Notes:

All proposed BMPs shall have accompanying drawings, design calculations, and any other necessary information.

All proposed BMPs shall be installed as directed by the design drawings. The use of the proper material, technique, and timing are crucial to a BMP that will provide the expected level and of control.

All proposed BMPs shall be maintained as directed by the design drawings. All maintenance requirements will be conducted by Fort Jackson. Fort Jackson expects that all BMPs be performing as designed prior to beginning any activities.



Fort Jackson  
Land Disturbance Handbook

BMP STANDARD NOTES

STANDARD DRAWING NO. WQ-14 Page 1 of 1

## **APPENDIX G**

### **USGS Regression Equations for Central South Carolina**

## USGS Regression Equations for Rural and Urban Areas in South Carolina

### Rural

$$Q_{R,2} = 25 * A^{0.74}, \quad \text{Equation 1}$$

$$Q_{R,5} = 44 * A^{0.72}, \quad \text{Equation 2}$$

$$Q_{R,10} = 59 * A^{0.71}, \quad \text{Equation 3}$$

$$Q_{R,25} = 80 * A^{0.70}, \quad \text{Equation 4}$$

$$Q_{R,50} = 97 * A^{0.70}, \quad \text{Equation 5}$$

$$Q_{R,100} = 116 * A^{0.69}, \text{ and} \quad \text{Equation 6}$$

$$Q_{R,500} = 179 * A^{0.66}, \quad \text{Equation 7}$$

where

$Q_{R,N}$  = peak discharge resulting from a storm event with a recurrence interval of N from rural area and

A = contributing area in square miles.

The above equations are valid only in the Upper Coastal Plains of South Carolina. Fort Jackson is considered to lie entirely within this region of the state.

### Urban

$$Q_{I,2} = 1.36 * A^{0.554} * IA^{1.24} * Q_{R2}^{0.323}, \quad \text{Equation 8}$$

$$Q_{I,5} = 2.58 * A^{0.544} * IA^{1.170} * Q_{R5}^{0.299}, \quad \text{Equation 9}$$

$$Q_{I,10} = 3.77 * A^{0.536} * IA^{1.115} * Q_{R10}^{0.291}, \quad \text{Equation 10}$$

$$Q_{I,25} = 5.84 * A^{0.524} * IA^{1.041} * Q_{R25}^{0.284}, \quad \text{Equation 11}$$

$$Q_{I,50} = 7.76 * A^{0.514} * IA^{0.987} * Q_{R50}^{0.283}, \quad \text{Equation 12}$$

$$Q_{I,100} = 10.4 * A^{0.506} * IA^{0.932} * Q_{R100}^{0.28}, \text{ and} \quad \text{Equation 13}$$

$$Q_{I,500} = 18.8 * A^{0.484} * IA^{0.800} * Q_{R500}^{0.281}, \quad \text{Equation 14}$$

where

$Q_{I,N}$  = peak discharge resulting from a storm event with a recurrence interval of N from urban areas,

A = contributing area in square miles,

IA = impervious area in square miles, and

$Q_{R,N}$  = peak discharge resulting from a storm event with a recurrence interval of N from rural areas using the rural equations (equations 1 – 7).

## **APPENDIX H**

### **NPDES Phase II Permit**

(to be inserted when issued by SCDHEC)



# APPENDIX

## QQ



Ed McDowell: (803) 751-6853, [ed.mcdowell1@us.army.mil](mailto:ed.mcdowell1@us.army.mil)

Matt Holstein: (803) 751-9504, [matthew.holstein@us.army.mil](mailto:matthew.holstein@us.army.mil)

## GUIDANCE FOR STORM WATER PERMITS FOR CONSTRUCTION ACTIVITIES FORT JACKSON, SOUTH CAROLINA

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### ***FOR LAND DISTURBANCE 1 ACRE OR GREATER:***

1. Fort Jackson is covered under the Small Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) General Permit. As part of this general permit, Fort Jackson is operating a Qualified Local Program (QLP) whereby plan review and construction inspection authority has been delegated to Fort Jackson by the South Carolina Department of Health and Environmental Control (DHEC). All Storm Water Pollution Prevention Plans (SWPPP) and Sediment and Erosion Control plans will be reviewed and approved by Fort Jackson, DPW, Environmental Division (ENV) prior to the start of construction.
2. All construction activities 1 acre or greater will adhere to the NPDES General Permit for Storm Water Discharges from Large and Small Construction Activities. All construction of any size will meet requirements of the South Carolina Storm Water Management and Sediment Control Act.
3. Hydrology
  - a. Utilize a volume-based hydrograph
  - b. Use the 24 hour rainfall event, SCS distribution with a 0.1 hour burst time increment.
  - c. Rational or modified rational methods can only be used for sizing individual culverts or storm drains not part of a network. The storm duration shall be equal to the time of concentration of the contributing drainage area or a minimum of 0.1 hour, whichever is less.
  - d. Rational method cannot be used for a storm drain network.
  - e. Use the 2- and 10- year frequency 24 hour duration storm event for pre- and post development calculations.
4. The Storm Water Pollution Prevention Plan (SWPPP) must meet requirements of the General Permit. We are looking for something similar to the EPA SWPPP template and the EPA SWPPP Guide. Some specific items that should be included are: (this is not an all-inclusive list)
  - a. A sectioned 3 ring binder.
  - b. Inspection Section
  - c. Co-Permittee Section
  - d. General Permit Section
  - e. Section for NOI and approval letters
  - f. Monthly report section
  - g. Storm Water Pre-construction section
  - h. Spill Response Plan and Hazardous Waste Plan
  - i. Pond Maintenance Plan and Pond Maintenance Agreement



5. Everything in the submittal should be in 1 three ring binder and a full size set of drawings.
6. Procedures are as follows:
  - a. Review Timelines. Every effort will be made to offer review comments within 20 calendar days of a submittal. When review comments are addressed and re-submitted, the 20 day clock starts over. Therefore, the time line from initial submission to final approval may be 60 to 90 days. It is possible for the timeline to be less than 60 days or more than 90 days, depending on the complexity of the project and the quality of the submittal.
  - b. The Fort Jackson Land Disturbance Design Manual should be utilized in preparing the SWPPP. The manual includes a variety of useful information and some preferred Best Management Practices (BMP). This, in no way, is to discourage innovation or the use of other BMPs, but is to serve as a guide for what Fort Jackson is looking for in a quality storm water plan. This manual will be updated periodically.
  - c. Submit draft plans for comment throughout the design process. This will help expedite the final review and approval process.
  - d. A completed design checklist must be submitted. (checklist will be specified by Fort Jackson ENV)
  - e. A completed Notice of Intent (NOI) must be submitted.
  - f. All plans must meet provisions of the NPDES General Permit for Storm Water Discharges from Large and Small Construction Activities and the South Carolina Storm Water Management and Sediment Control Act.
  - g. A check, made out to DHEC in the amount of \$125 is to be included in the final submission. (This check is to be provided by the proponent, design engineering firm, or contractor). DHEC also accepts credit card payments.
  - h. Once the plan is approved by ENV, Fort Jackson will submit the \$125 check, NOI, and Fort Jackson approval letter to DHEC. General Permit coverage should be granted by DHEC within 7 days of receipt of the application package.
  - i. **Land disturbance cannot begin until General Permit coverage is granted by DHEC.**

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#### LINKS:

DHEC Construction Web Site: <http://www.scdhec.net/environment/water/swerfmain.htm>

NOI: <http://www.scdhec.gov/administration/library/d-2617.pdf>

Pond Maintenance Agreement:

[http://www.scdhec.gov/environment/ocrm/permit/docs/FORMS/Pond\\_Maint.pdf](http://www.scdhec.gov/environment/ocrm/permit/docs/FORMS/Pond_Maint.pdf)

Construction General Permit: <http://www.scdhec.net/environment/water/docs/finalcgp.pdf>

# APPENDIX

## RR



## Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

"Yes", "No", "NA"	Page or Sheet # Be Specific	Please indicate the location and page number(s) where each item below can be found in your SWPPP or supporting calculations. If an item is not applicable, put N/A. Fort Jackson reserves the right to modify this checklist at any time.	COMMENTS
		<b>Project Title:</b> _____	
		<b>How many acres of land disturbance?</b>	
		<b>Checklist Completed by:</b>	
		Printed name: _____ Signature: _____	
		Date: _____	
		<b>1.00 CURRENT COMPLETED APPLICATION FORM</b>	
		· Does the NOI have the original signatures?	
		· Is this the proper signatory authority?	
		· Are all items completed and answered?	
		· Is there a \$125 check attached? Review fee is not applicable. Fort Jackson will review and not DHEC	
		<b>2. COPIES OF PLANS AND CALCULATIONS</b>	
		There should be 2 items submitted: the drawings and the SWPPP. All documentation, calculations, NOI, etc should be included in the SWPPP. There should be no loose documents.	
		<b>3. LOCATION MAP</b>	
		· Is there a North arrow and scale?	
		· Is the project location outlined?	
		· Are the road names labeled?	
		<b>4. PROJECT NARRATIVE</b>	
		· Is the scope of project outlined, including a brief description of pre- and post-development conditions?	
		· Is there a summary table of pre- and post-development flows (at least 2- and 10-year, 24-hour storm events)	
		· Are existing flooding problems in the surrounding area described?	
		· Are disturbed area calculations included for subdivision projects or LCP disturbing 1 or more acres?	
		Ø For subdivisions if the site is not to be mass-graded, the following formula should be used to determine the amount of disturbance:	
		Amount of Disturbance = 2[Max Restricted Building Size][Number of Lots] + Right of Way (ROW) areas {ROW areas include clearing for roads, utilities, easements etc.}	

### Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

<b>"Yes"</b> <b>"No"</b> <b>"NA"</b>	<b>Page or Sheet #</b> <b>Be Specific</b>	<b>Please indicate the location and page number(s) where each item below can be found in your SWPPP or supporting calculations. If an item is not applicable, put N/A. Fort Jackson reserves the right to modify this checklist at any time.</b>	<b>COMMENTS</b>
		<p>Ø If this equation is used, include a note on the plans stating: "The site is not to be mass-graded. Only 2 times the footprint is to be cleared as the lots are developed. The assumed disturbance on each lot is _____ sq. ft.</p>	
		<p><b>5. USGS TOPOGRAPHIC MAP</b></p> <ul style="list-style-type: none"> <li>Is the project boundary outlined on the topo map?</li> <li>Is the route of runoff from site to nearest waterbody shown?</li> <li>Are Road names adjacent to site labeled?</li> </ul>	
		<p><b>6. SOILS INFORMATION</b></p> <ul style="list-style-type: none"> <li>Is the project boundary outlined on a soils map?</li> <li>Are predominate soil types found at the site identified on the plans or on a separate map?</li> <li>Note: Soils information is available from the Natural Resource Conservation Service through their website: <a href="http://websoilsurvey.nrcs.usda.gov/app/">http://websoilsurvey.nrcs.usda.gov/app/</a></li> </ul>	
		<p><b>7. FLOODWAY MAPS/FEMA FLOOD INSURANCE MAP</b></p> <ul style="list-style-type: none"> <li>Is the project boundary outlined, if in close proximity to floodplain/ floodway?</li> </ul>	
		<p><b>8. WATERS OF THE STATE, INCLUDING WETLANDS</b></p>	
		<p>Is a 404 permit required? (2.I.C)</p> <p>Has a 404 permit been issued? (2.I.C)</p>	
		<ul style="list-style-type: none"> <li>Is there a delineation of all waters of the State (WoS), including wetlands, shown and labeled on plans (delineation not required if a 100-ft undisturbed buffer can be maintained between the WoS and all land-disturbing activities)</li> </ul>	
		<ul style="list-style-type: none"> <li>Is there an additional, separate plan sheet that shows all WoS on the site and the impacted areas with a description of the activity(s), whether it is permanent or temporary, and any other relevant information?</li> </ul>	
		<ul style="list-style-type: none"> <li>If impacts to WoS, are areas of impacts outlined and labeled that no work can begin in this area until all necessary USACOE permits and SCDHEC 401 certifications have been obtained.</li> </ul>	
		<ul style="list-style-type: none"> <li>Is a double row of silt fence provided in all areas where a 50' undisturbed buffer cannot be maintained between the disturbed area and the WoS?</li> </ul>	
		<ul style="list-style-type: none"> <li>Is there a minimum 10' maintenance buffer provided between last row of silt fence and WoS; or, if buffer not provided, then statement from P.E. on plans indicating how silt fence will be installed and maintained without impacts to WoS?</li> </ul>	
		<ul style="list-style-type: none"> <li>Note: If there are proposed impacts to WoS, then it is advised that you contact USACOE (866-329-8187) and/ or S.C. DHEC Water Quality Certification, Standards &amp; Wetlands Programs Section (803-898-4300) to determine additional requirements before submitting the Notice of Intent (NOI).</li> </ul>	



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		<ul style="list-style-type: none"> <li>Note: If WoS are to be impacted, work cannot be performed in these designated areas until all necessary permits have been acquired</li> <li>Note: If a USACOE permit is required for construction of or access to a temporary or permanent stormwater management structure, NPDES permit coverage cannot be granted until the USACOE permits and S.C. DHEC 401 Section certifications are obtained.</li> <li>Note: The Department recommends a minimum 20-foot buffer between a sediment trap/basin and WoS.</li> </ul>	
		<b>9. HYDROLOGIC ANALYSIS</b>	
		<ul style="list-style-type: none"> <li>Have you provided pre- and post-developed hydrologic analysis calculations for the 2- and 10-year, 24-hour storm events at each outfall point?</li> <li>Have you provided drainage area maps that clearly correspond to the calculations (pre- and post-development)</li> <li>Analysis points for comparing runoff rates and the total drainage area analyzed do not change from pre- to post-development, although the immediate drainage areas contributing to each analysis point might shift.</li> <li>Post-development discharges less than pre-development discharges for each outfall point (if not, then see "Detention Waiver" section below)</li> <li>Was the analysis performed using SCS 24-hour storm? (Rational method is not acceptable)</li> <li>Was Rainfall data from South Carolina DHEC Storm Water Management BMP Handbook (BMP Handbook) used in all calculations?</li> </ul>	
		<ul style="list-style-type: none"> <li>Note: The curve number for open water, marshes, etc. should be 98 to 100.</li> </ul>	
		<b>10. DETENTION ANALYSIS/DESIGN</b>	
		<ul style="list-style-type: none"> <li><b>Analysis</b> <ul style="list-style-type: none"> <li>Did pond routing use a volume-based hydrograph for the 2- and 10-year, SCS 24-hour storm event (Drain:Edge, ICPR, HEC-1, SedCAD, HYDRAFLOW, etc. perform full pond routings; TR55 does not perform a full pond routing; rational method cannot be used)</li> <li>Are hydrologic and hydraulic calculations included? These will determine the impact of hydrograph timing modifications of the proposed land-disturbing activity, with and without the detention structure (results of analysis will determine the need to modify the detention design or eliminate the detention requirement—see note 2 below)</li> <li>Are inputs and outputs from the analysis program?</li> <li>Is there a summary table of the peak inflows, peak outflows, discharge velocities, and maximum water surface elevations (WSE) for the 2- and 10-year, 24-hour storm events for each detention structure</li> <li>Is the stage-storage-discharge relationship for the outlet structure of each detention structure included?</li> </ul> </li> </ul>	

### Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

"Yes", "No", "NA"	Page or Sheet # Be Specific	<i>Please indicate the location and page number(s) where each item below can be found in your SWPPP or supporting calculations. If an item is not applicable, put N/A. Fort Jackson reserves the right to modify this checklist at any time.</i>	COMMENTS
		> If a rating curve for the outlet structure must be generated externally from the analysis program (Drain:Edge, HEC-1, etc.), are data and equations used to rate the outlet structure included?	
		> Does the site drain to an existing detention pond? (see below)	
		> If so, is an As-built of the existing detention pond included? (see below)	
		Ø Note: SedCAD users please refer to the memo regarding the input of outlet structures.	
		> Note: The Department recommends using the 10% rule in performing analysis. The hydrologic analysis should be conducted for the larger drainage area, where the site in question encompasses 10% of the total drainage area. For example, if your site is 10 acres, then the hydrologic analysis should be performed at the point downstream where the contributing drainage area, including your 10-acre site, is approximately 100 acres.	
		Was the 10% rule used in performing the hydrologic analysis? If not provide an explanation.	
		• Design	
		> Is there a detail of outlet structure and cross-section of the dam/ berm or pond bank?	
		> Are elevations and dimensions that correspond to the calculations included?	
		> Was orifice constructability considered (do not specify orifice diameters with increments of less than 1/4")	
		> Is the maximum WSE for the 10-year storm event below the emergency spillway?	
		> Is there a 0.5-ft of freeboard between maximum WSE for the 10-year storm and the emergency spillway?	
		> Is the maximum WSE for the 100-year storm event below the embankment?	
		> Is there a 0.5-ft of freeboard between maximum WSE for the 100-year storm and the embankment?	
		> Are there included dewatering time calculations for the 10-year storm event? (dry ponds must drain completely within 72 hours)	
		> Is the bottom of all detention and retention ponds graded to have a slope of not less than 0.5%?	
		> Is a low flow or pilot channel constructed across the pond bottom from the inlet to the outlet to prevent standing water conditions?	
		> If the pond is to be used for sediment control during construction, is a temporary horseshoe-shaped riprap berm in front of any low level outlets provided during construction and shown on the pond detail?	
		> Is there permanent maintenance access to all permanent detention structures?	
		> Are infiltration systems designed in accordance with S.C. Reg. 72-307.C(11) [specify how items a-j have been addressed]	
		> Are emergency spillways built on fill slopes? (should not be)	



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		<ul style="list-style-type: none"> <li>➤ Is a trash rack or other debris-screening device included on all pond risers?</li> <li>➤ Is there a maximum slope of 3:1 on pond embankments to allow for ease of maintenance?</li> <li>➤ Are sediment forebays at each outfall into the detention/ sediment basin included?</li> </ul>	
		<b>11. AS-BUILTS</b>	
		<ul style="list-style-type: none"> <li>• Are As-Builts provided for all previously approved detention ponds that will receive flows from new drainage areas?</li> </ul>	
		<ul style="list-style-type: none"> <li>• Were these As-Builts prepared by a South Carolina Licensed Land Surveyor</li> <li>• Do the As-Builts include grades/ contours/ depths for the pond?</li> </ul>	
		<ul style="list-style-type: none"> <li>• Are elevations and dimensions of all outlet structures included? Including:               <ul style="list-style-type: none"> <li>➤ Pipe and orifice inverts and diameters?</li> <li>➤ Weir elevations and dimensions?</li> <li>➤ Riser dimensions and elevations?</li> <li>➤ Emergency spillway dimensions and elevations?</li> <li>➤ Locations and inverts for all pipes discharging into the pond?</li> </ul> </li> <li>• If the elevations or dimensions of the structures listed above do not match those used in the approved plans, certification statement signed by the project's Registered Engineer indicating that the pond, as built, will function within all applicable standards provided [new analysis of the pond (routing) may be necessary] Is this certification provided?</li> </ul>	
		<ul style="list-style-type: none"> <li>• <i>Note: As-built survey and /or analysis must be submitted and accepted by the Department before Notice of Termination (NOT) is submitted.</i></li> </ul>	
		<b>12. PERMANENT STORMWATER MANAGEMENT STRUCTURE MAINTENANCE</b>	
		<ul style="list-style-type: none"> <li>• Is there a signed agreement from the responsible party accepting ownership and maintenance of the structure?</li> <li>• Is there a description of maintenance plan to be used?</li> <li>• Is there a schedule of maintenance procedures (e.g., every 6 months)?</li> <li>• Are there detailed or manufacturer-specific maintenance items for proprietary control devices (oil-water separators, etc.), underground detention structures, exfiltration systems and non-traditional stormwater controls (constructed wetlands, bioretention, etc.)</li> <li>• Are typical maintenance items addressed? Such as:               <ul style="list-style-type: none"> <li>➤ Grass to be mowed?</li> <li>➤ Trees to be removed from within the pond and on the embankment?</li> <li>➤ Trash and sediment to be removed from inside of and around the pond outlet structure?</li> <li>➤ Orifices to be cleaned and unclogged?</li> <li>➤ Outlet pipe to be cleaned, inspected, and repaired?</li> </ul> </li> </ul>	

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	<p><i>Please indicate the location and page number(s) where each item below can be found in your SWPPP or supporting calculations. If an item is not applicable, put N/A. Fort Jackson reserves the right to modify this checklist at any time.</i></p> <ul style="list-style-type: none"> <li>➤ Sediment accumulation to be removed from pond?</li> <li>➤ Pond bottom to be regraded to provide proper drainage towards the outlet discharge point?</li> <li>➤ Energy dissipator to be cleaned and repaired?</li> <li>➤ Emergency spillway, if applicable, to be inspected and repaired ?</li> <li>➤ Erosion on side slopes, if present, to be addressed?</li> </ul>	
	<p><b>13. DISCHARGE POINTS</b></p> <ul style="list-style-type: none"> <li>• Are storm drainage or pond outfalls carried to an existing drainage outfall such as a pipe, ditch, etc.?</li> <li>• Are there any new point discharges onto adjacent property where there was not a point discharge previously?</li> </ul> <p>If yes, is there written permission from the adjacent property owner?</p> <ul style="list-style-type: none"> <li>• Are level spreaders, plunge pools, etc. provided when the proposed outlet is near the property line and not directed to an existing outfall, such as a creek or ditch?</li> <li>• Is there a twenty (20)-foot minimum buffer is provided between the property line and the discharge point?</li> <li>• Do outlets discharge on fill slopes? (Outlets should not discharge onto fill slopes)</li> </ul>	
	<p><b>14. DETENTION WAIVER</b></p> <ul style="list-style-type: none"> <li>• <u>Note: If the 2- and 10-year, 24-hour post-developed flow rates exceed the pre-developed rates, waivers from detention may be granted in accordance with regulation 72-302(B) on a case-by-case basis</u></li> <li>• <u>Justification and a written request, including the following statement: "the increased flows will not have a significant adverse impact on the downstream/adjacent properties"</u></li> </ul> <ul style="list-style-type: none"> <li>• A project may be eligible for a waiver or variance of stormwater management for water quantity control if the applicant can demonstrate that:               <ul style="list-style-type: none"> <li>➤ The proposed project will have no significant adverse impact on the receiving natural waterway or downstream properties; or</li> <li>➤ The imposition of peak control requirements for rates of stormwater runoff would aggravate downstream flooding</li> </ul> </li> <li>• Is the Waiver signed by the project's Professional Engineer?</li> <li>• <i>Note: See note in checklist item 10 regarding the 10% rule.</i></li> </ul>	
	<p><b>9. PERMANENT WATER QUALITY REQUIREMENTS</b></p> <ul style="list-style-type: none"> <li>• Has permanent water quality been addressed? (all projects or LCP that disturb 5 or more acres)               <ul style="list-style-type: none"> <li>➤ Wet ponds designed to catch the first ½" of runoff from the entire area draining to the pond and release it over at least a 24-hour period</li> <li>➤ Dry ponds designed to catch the first 1" of runoff from the entire area draining to the pond and release it over at least a 24-hour period</li> </ul> </li> </ul>	



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		<ul style="list-style-type: none"> <li>➤ For areas not draining to a pond, show how permanent water quality requirements were addressed.</li> </ul>	
		<ul style="list-style-type: none"> <li>• Arc Waters of the U.S./State used for permanent water quality control? (alternative means of treatment must be used if an existing pond is to be used for water quantity control).</li> </ul>	
		<p><u>Note: Other non-traditional stormwater controls such as Bioretention areas, constructed wetlands, etc. may be used. Consult the BMP Handbook for information on the design of these devices.</u></p>	
		<ul style="list-style-type: none"> <li>• <u>Note: Pre-fabricated or proprietary treatment devices are approved on a case-by-case basis if adequate removal efficiency can be demonstrated. Provide pollutant removal efficiency data, preferably from a third-party testing company. Type of system selected should be based on the ability to remove the pollutants of concern in that area/situation (bacteria, hydrocarbons, etc.).</u></li> </ul>	
		<b>16. SEDIMENTOLOGY</b>	
		Do 10 or more acres drain to a common point? (stream, lake, etc?)	
		<ul style="list-style-type: none"> <li>• Do trapping efficiency calculations show that all sediment basins/ traps are capable of achieving a sediment trapping efficiency of at least 80% for the 10-year, 24-hour storm event, if more than 10 disturbed acres drain to a common point (stream, lake, etc.)</li> </ul>	
		<ul style="list-style-type: none"> <li>• Do sediment basins provide storage for the 10-year, 24-hour storm event for disturbed conditions or 3600 ft<sup>3</sup>/ acre draining to the basin, if more than 10 disturbed acres drain to a common point (stream, lake, property line, etc.)</li> </ul>	
		<ul style="list-style-type: none"> <li>• Are sediment traps only used for drainage areas of less than 5 acres?</li> </ul>	
		<ul style="list-style-type: none"> <li>• Do sediment trap storage calculations show that 1800 ft<sup>3</sup>/ total acre draining to each trap is provided below the spillway?</li> </ul>	
		<ul style="list-style-type: none"> <li>• If trapping efficiency calculations are required for sediment traps, are peak outflow, <math>q_{po}</math>, calculations provided??</li> </ul>	
		Will the 10-year, 24-hour storm event for construction conditions overtop the trap's spillway? (it must not)	
		<ul style="list-style-type: none"> <li>• Are sediment basins and traps designed for total area draining to them?</li> </ul>	
		<ul style="list-style-type: none"> <li>• Is a drainage area map included that outlines the area draining to each basin/ trap?</li> </ul>	
		<ul style="list-style-type: none"> <li>• Are copies of figures used to determine <math>V_{15}</math> (SV-1) and trapping efficiency (ST-1, SB-1, SB-2) included, if Design Aids from BMP manual are used to determine trapping efficiencies?</li> </ul>	
		<ul style="list-style-type: none"> <li>• Is silt fence only used in areas with drainage areas of less than ¼ acre per 100 LF of fence?</li> </ul>	
		Is silt fence used in areas with concentrated flows?	
		<ul style="list-style-type: none"> <li>• Is a clean-out stake, marked at ½ the designed sediment storage depth, provided in all sediment basins/ sediment traps?</li> </ul>	
		<p><u>Note: Consult the BMP Handbook for information on the design of these and other devices.</u></p>	

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		<p>Note: The Design Aids in the BMP Handbook cannot be used to determine trapping efficiencies for structures in series. If the flow for the 10-year, 24-hour storm for construction conditions overtops the structure or the structure's spillway, then the Design Aids cannot be used. If multiple soil types are in the area draining to the structure, then the soil type with the smallest D15 for the appropriate depth should be used to determine the settling velocity, V15; an average D15 should not be used.</p> <p>Note: SedCAD users please refer to the memo regarding the input of outlet structures.</p>	
		<b>17. STABLE CHANNEL CALCULATIONS</b>	
		<ul style="list-style-type: none"> <li>Are all channels and diversion ditches able to handle the 10-year storm event with non-erosive velocities of less than 5 feet per second during construction and post-construction? (use appropriate CN for disturbed areas)</li> </ul>	
		Does the velocity in channels exceed 5 ft/s?	
		If channel velocity exceeds 5 ft/s, are permanent measures to reduce the velocity to a non-erosive rate provided?	
		<ul style="list-style-type: none"> <li>Are rock check dams provided in temporary diversions</li> <li>Are installation details for erosion control blanket (ECB) or turf reinforcement matting (TRM) included if ECBs or TRMs to be used</li> </ul>	
		<b>18. INLET PROTECTION</b>	
		<ul style="list-style-type: none"> <li>Provided at all inlets?</li> <li>Are hay bales used for inlet protection? (should not be used)</li> <li>Steel posts and buried fabric shown for filter fabric inlet protection?</li> <li>Inlet protection details provided for pre-paving and after roadways have been paved?</li> </ul>	
		How many acres drain to each inlet?	
		Note: The Department recommends that an inlet not have more than one (1) acre draining to it.	
		<b>19. ENERGY DISSIPATORS/ OUTLET PROTECTION</b>	
		<ul style="list-style-type: none"> <li>All outlets stabilized?</li> <li>Riprap aprons sized appropriately?</li> <li>Riprap detail shows apron dimensions and stone sizes for each pad or each pipe diameter?</li> <li>Filter fabric installed beneath all riprap?</li> </ul>	
		<b>20. FILL SLOPES AND/ OR EMBANKMENTS</b>	
		<ul style="list-style-type: none"> <li>All slopes stabilized</li> <li>Slope drains designed in accordance with the BMP Handbook</li> <li>Are slope drains provided where concentrated flows discharge onto a fill slope?</li> <li>For all slopes steeper than 1.5:1, are stabilization practices identified? (e.g., ECB, TRM)</li> </ul>	



## Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

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		<ul style="list-style-type: none"> <li>Note: Measures, in addition to grassing or hydroseeding, include synthetic or vegetative matting, diversion berms, temporary slope drains, etc.</li> </ul>	
		<ul style="list-style-type: none"> <li>Note: If retaining walls or fill slopes are to be constructed at the downstream property line, the Department recommends a 10' buffer to allow for construction and maintenance. If a 10' buffer is not provided, then provide permission from the adjacent property owner for possible land-disturbing activities on his property.</li> </ul>	
		<b>21. UTILITY LINES</b>	
		<ul style="list-style-type: none"> <li>Do Limits of disturbance include areas disturbed for water and sewer line installation?</li> </ul>	
		<ul style="list-style-type: none"> <li>Is inlet protection provided at all existing inlets that receive flows from the disturbed areas? (also add this as a note on the plans)</li> </ul>	
		<ul style="list-style-type: none"> <li>For all utility lines crossing WoS, is a narrative and detail showing sediment and erosion control measures provided on plans?</li> </ul>	
		<ul style="list-style-type: none"> <li>Are construction entrances provided at all locations where construction traffic accesses a paved roadway?</li> </ul>	
		<b>22. TMDL/ 303d IMPAIRED WATERBODIES</b>	
		Is there a TMDL on the receiving water body? (1.3.C.4)	
		<ul style="list-style-type: none"> <li>List the nearest S.C.DHEC Water Quality Monitoring Station (WQMS) that the site's stormwater discharges drain to and the waterbody on which it is located:</li> </ul>	
		Is there an approved TMDL for this WQMS?	
		Will the site's stormwater construction discharges contain the pollutant of impairment?	
		If so, are measures and controls on SWPPP to meet assumptions and requirements of TMDL (may need to contact Watershed Manager for assistance)	
		<ul style="list-style-type: none"> <li>Qualitative and quantitative assessment (described in Section 3.4C of SCR100000), if nearest WQMS listed on the 2004 303(d) List of Impaired Waters and if site's stormwater construction discharges contain the pollutant of impairment and if site disturbs 25 or more acres</li> </ul>	
		<ul style="list-style-type: none"> <li>Evaluation of selected BMPs if nearest WQMS listed on the 2004 303(d) List of Impaired Waters and if site's stormwater construction discharges contain the pollutant of impairment and if site disturbs less than 25 acres</li> </ul>	
		<ul style="list-style-type: none"> <li>Note: Contact Department staff for guidance on selection of BMPs based on pollutant of impairment.</li> </ul>	
		<b>23. NAVIGABLE WATERS</b>	

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		<ul style="list-style-type: none"> <li>Extra plan sheet showing impacts to navigable water and description of activity included if S.C. Navigable Waters (SCNW) crossing and separate SCNW permit has not been obtained for all activities</li> </ul>	
		<ul style="list-style-type: none"> <li><i>Note: For NOIs initially submitted to delegated entities, if project has SCNW crossing and if separate SCNW permit has not been obtained for this crossing, then this item will be reviewed by S.C. DHEC before NPDES coverage will be granted.</i></li> </ul>	
		<b>24. OCRM REQUIREMENTS - NOT APPLICABLE</b>	
		<b>25. SITE PLANS CHECKLIST:</b>	
		<ul style="list-style-type: none"> <li><i>Note: The Department may require phased sediment and erosion control plans for large or complicated projects.</i></li> </ul>	
		<ul style="list-style-type: none"> <li>Location map with site outlined on first plan sheet (map should have enough detail to identify Surface Waters of the State within 1 mile of the site)</li> <li>North arrow and scale</li> <li>Property lines and adjacent landowners' names</li> <li>Legend</li> <li>Registered engineer's signed and dated seal</li> <li>Engineering Firm's Certificate of Authorization seal</li> <li>Existing and proposed contours for entire disturbed area</li> <li>Limits of disturbed area</li> <li>Locations of off-site material, waste, borrow, or construction equipment storage areas, excluding roll-off containers (<i>Note: Some off-site disturbed areas may require a separate application for NPDES coverage</i>)</li> <li>Location and identification of any stormwater discharges associated with industrial activity (not construction)</li> <li>Delineation of WoS, including wetlands (see checklist item 8)</li> <li>Easements</li> <li>Road profiles with existing and proposed ground elevations (if no contours are shown on the plans)</li> <li>Grassing and stabilization specifications (temporary and permanent)</li> </ul>	
		<ul style="list-style-type: none"> <li>Construction sequence (implementation of all stormwater and sediment controls in the first phase of construction; ensure that basins, traps, ponds, etc. can be installed before the area draining to them is cleared and grubbed)</li> </ul>	
		<ul style="list-style-type: none"> <li>Standard notes (see following page)</li> <li>Temporary and permanent control measures (provide details of all sediment and erosion control measures used; make sure the label or legend on the plans matches the name on the detail)</li> </ul>	
		<i>Note: Maintenance requirements for each BMP should be listed on the detail.</i>	
		<i>Note: If details from the BMP Handbook are used, then the inspection frequency must be changed to be in accordance with the new CGP (see Standard note 3).</i>	



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		<b>26. Standard Notes</b>	
		1. If necessary, slopes, which exceed eight (8) vertical feet should be stabilized with synthetic or vegetative mats, in addition to hydroseeding. It may be necessary to install temporary slope drains during construction. Temporary berms may be needed until the slope is brought to grade.	
		2. Stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than fourteen (14) days after work has ceased, except as stated below.	
		➤ Where stabilization by the 14 <sup>th</sup> day is precluded by snow cover or frozen ground conditions stabilization measures must be initiated as soon as practicable.	
		➤ Where construction activity on a portion of the Site is temporarily ceased, and earth-disturbing activities will be resumed within 14 days, temporary stabilization measures do not have to be initiated on that portion of the Site.	
		3. All sediment and erosion control devices shall be inspected every seven (7) days. If site inspections identify BMPs that are damaged or are not operating effectively, maintenance must be performed as soon as practical or as reasonably possible and before the next storm event whenever practicable.	
		OR	
		All sediment and erosion control devices shall be inspected at least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater. If site inspections identify BMPs that are damaged or are not operating effectively, maintenance must be performed as soon as practical or as reasonably possible and before the next storm event whenever practicable.	
		4. Provide silt fence and/or other control devices, as may be required, to control soil erosion during utility construction. All disturbed areas shall be cleaned, graded, and stabilized with grassing immediately after the utility installation. Fill, cover, and temporary seeding at the end of each day are recommended. If water is encountered while trenching, the water should be filtered to remove any sediments before being pumped back into any waters of the State.	

### Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

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		5. All erosion control devices shall be properly maintained during all phases of construction until the completion of all construction activities and all disturbed areas have been stabilized. Additional control devices may be required during construction in order to control erosion and/or offsite sedimentation. All temporary control devices shall be removed once construction is complete and the site is stabilized.	
		6. The contractor must take necessary action to minimize the tracking of mud onto paved roadway(s) from construction areas and the generation of dust. The contractor shall daily remove mud/soil from pavement, as may be required.	
		7. Residential subdivisions require erosion control features for infrastructure as well as for individual lot construction. Individual property owners shall follow these plans during construction or obtain approval of an individual plan in accordance with S.C Reg. 72-300 et seq. and SCR100000.	
		8. Temporary diversion berms and/or ditches will be provided as needed during construction to protect work areas from upslope runoff and/or to divert sediment-laden water to appropriate traps or stable outlets.	
		9. All waters of the State (WoS), including wetlands, are to be flagged or otherwise clearly marked in the field. A double row of silt fence is to be installed in all areas where a 50-foot buffer can't be maintained between the disturbed area and all WoS. A 10-foot buffer should be maintained between the last row of silt fence and all WoS.	
		10. Litter, construction debris, oils, fuels, and building products with significant potential for impact (such as stockpiles of freshly treated lumber) and construction chemicals that could be exposed to storm water must be prevented from becoming a pollutant source in storm water discharges.	
		<b>27. Storm Water Pollution Prevention Plan (SWPPP)</b>	
		Are BMPs identified in the SWPPP covering the discharges from the support activity areas? (e.g.) concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow pits) (1.3.A.3 page 2)	
		If land disturbance is > 2 acres, was the SWPPP prepared by a professional engineer, landscape architect, Tier B land surveyor, or federal government employee. (3.1, page 8)	
		Are all potential sources of pollution identified? (3.1.B.1, page 9)	
		Does the SWPPP indicate the name of the Operator with day-to-day operational control? (3.2, page 10)	
		Are practices described that will be used to reduce pollutants? (3.1.B.2, page 9)	



## Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

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		Is a preconstruction conference with co-permittees and contractor referenced in the SWPPP? (3.2.A.5. page 9)	
		Does the SWPPP identify parties responsible for implementing control measures? (3.2.B.1)	
		Does the SWPPP indicate the parties with operational control over project specifications? (3.2.B.2)	
		Does the SWPPP indicate parties with Operational Control? (3.2.B.3)	
		Does the SWPPP contain all operators and areas over which each operator has control? (3.3.A.)	
		Does the SWPPP describe the nature of the construction activity? (3.3.B)	
		Does the SWPPP contain the function of the project (low density residential, shopping mall, highway, etc)? (3.3.B.1)	
		What is the function of the project (low density residential, shopping mall, highway, etc)?	
		Does the SWPPP contain the intended sequence and timing of planned major activities that disturb soil? i.e. a construction sequence? (3.3.B.2)	
		Does the SWPPP contain the total area disturbed including off-site borrow and fill areas? (3.3.B.3)	
		Are off-site borrow and fill areas included in acreage? (3.3.B.3)	
		Does the SWPPP contain the general location map that identifies the construction site and surface waters within 1 mile of the site? (3.3.B.4)	
		Does the SWPPP contain a map showing direction of stormwater flow and approximate slopes after grading? (3.3.C.1)	
		Does the SWPPP contain a map showing areas disturbed and not disturbed? (3.3.C.2)	
		Does the SWPPP contain a map showing locations of structural or non-structural BMPs? (3.3.C.3)	
		Does the SWPPP contain a map showing locations where stabilization practices will occur? (3.3.C.4)	
		Does the SWPPP contain a map showing locations of off-site material, waste. Borrow. Pit construction, equipment storage? (3.3.C.4)	
		Does the SWPPP contain a map showing locations of all surface waters and wetlands? (3.3.C.6)	
		Does the SWPPP contain a map showing locations where stormwater discharges to a surface water? (3.3.C.7)	
		Does the SWPPP describe and identify the location of dedicated asphalt plants? (3.3.D)	
		Does the SWPPP describe and identify the location of dedicated concrete plants? (3.3.D)	
		Does the SWPPP include a description of all BMPs? (3.4.A)	
		Does the SWPPP include a construction sequence? (3.4.A)	
		Does the SWPPP include a schedule of when stabilization practices will be implemented? (3.4.A)	
		Does the SWPPP include which Operator is responsible for the control measure's implementation? (3.4.A)	
		Does the SWPPP include a description of interim and permanent stabilization practices? (3.4.B)	
		If so, what TMDL and which waterbody. (3.4.C)	

### Fort Jackson Storm Water Pollution Prevention Plan (SWPPP) Review Checklist

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		<p><i>Please indicate the location and page number(s) where each item below can be found in your SWPPP or supporting calculations. If an item is not applicable, put N/A. Fort Jackson reserves the right to modify this checklist at any time.</i></p>
		Does the SWPPP include a description of structural practices to divert flows from exposed soils, to retain/detain flows; or to otherwise limit runoff and the discharge of pollutants from exposed areas of the Site. Placement of structural practices in floodplains must be in accordance with applicable regulations. (3.4.E)
		Does the SWPPP include a description of all post-construction storm water management measures that will be installed during the construction process to control pollutants in storm water discharges after construction operations have been completed.? (3.4.F)
		Does the SWPPP describe measures to prevent the discharge of building or other similar materials to Surface Waters of the State, except as authorized by a permit issued under section 404 of the CWA? (3.4.H)
		Does the SWPPP describe measures to minimize, to the extent practicable, off-site vehicle tracking of sediments onto paved surfaces and the generation of dust? (3.4.I)
		Does the SWPPP include a description of construction and waste materials expected to be stored on-site with updates as appropriate? (3.4.J)
		Does the SWPPP include a description of controls, including storage practices such as rolloff containers, to minimize exposure of the materials to storm water, and spill prevention and response practices? (3.4.J.)
		Does the SWPPP include a description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those Sites to minimize pollutant discharges? (reference 3.4.K 2006 GP) (3.4.K)
		Does the SWPPP identify all allowable sources of non-storm water discharges listed in Subpart 1.3.B of this permit, except for flows from fire fighting activities? (3.5 page 16)
		Are BMPs identified for these allowed non-stormwater discharges? (3.5)
		Are copies of this permit, the signed and certified NOI form, the Copermittee certifications required by Subpart 3.2.D, and, if applicable, any local approval included in the SWPPP. (3.8)
		Is the construction inspection schedule indicated in the SWPPP? (3.10)
		Does the SWPPP indicate who will be doing the inspections and what their qualifications are? (3.10.D)



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		Which of the following will the inspector be? (3.10.D)  1. Preparer of SWPPP 2. Under direct supervision of preparer of SWPPP 3. Individual certified through Construction Site Inspector Certification Course 4. Person with a registration equivalent to SWPPP preparer. 5. Person under direct supervision of person with a registration equivalent to SWPPP preparer 6. For projects 2 acres or less, preparer of SWPPP (or equivalent registration) can explain SWPPP to an inspector.	
		If 10 or more acres are disturbed: (3.13.E) 1. Has a sediment basin been incorporated? 2. Does the sediment basin provide storage for a minimal 10-year, 24 hour storm event? 3. If there are no calculations, does the sediment basin have a minimum of 3,600 cubic feet of storage/acre drained? 4. Do not have to include drainage area that is diverted around the basin. 5. If a sediment basin is not possible, is a series of smaller sediment basins or traps utilized?	
		Is the site less than 10 acres? : (3.13.E.3) 1. Smaller sediment basins or traps should be used. 2. Silt fences, or other BMPs are required on all downslope boundaries unless a sediment basin is provided. 3. If no sediment basin is provided, each structural BMP must be designed for the drainage area it serves.	
		The SWPPP should be in a 3 ring binder and include the following (this is not an all inclusive list) :	